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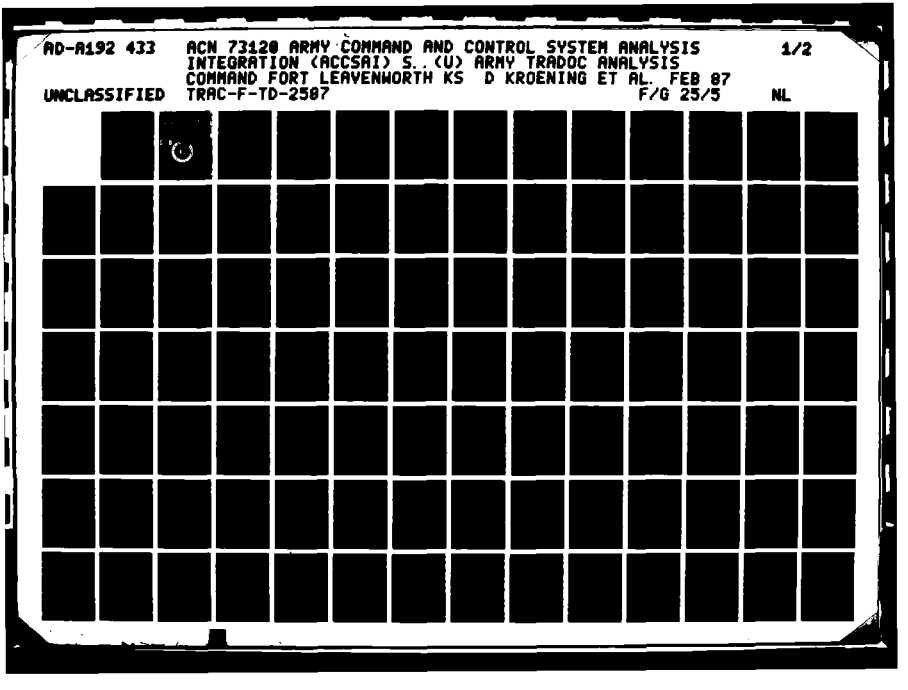

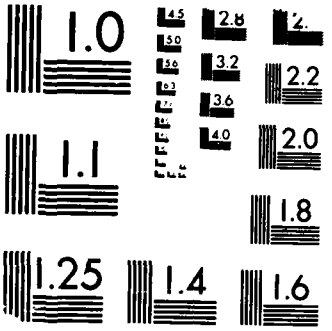

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ARMY COMMAND AND CONTROL SYSTEM ANALYSIS INTEGRATION (ACCSAI) STUDY

VOLUME I:

MAIN REPORT AND APPENDIXES A - F

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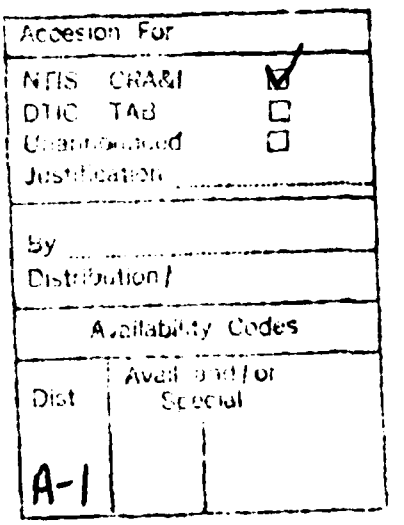

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The Army Command and Control System Analysis Integration (ACCSAI) project developed a management program and management structure which were recommended to integrate Army Command and Control System analysis, tools, and data collection efforts. This document is the final report concerning the project.

The project required the development of methodologies to sequence studies, categorize studies, and prioritize studies. Computer programs were written to assist the user in implementing the methodologies. Additionally, a data base was developed for storage of information concerning Army Command and Control System studies.

As this project evolved, it became necessary to reconsider the level of implementation (Army-wide versus MACOM level). The alternatives considered are discussed and the level of implementation chosen is detailed.

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ABSTRACT

The Army Command and Control System Analysis Integration (ACCSAI) project developed a management program and management structure which were recommended to integrate Army Command and Control System analyses, tools, and data collection efforts. This document is the final report concerning the project.

The project required the development of methodologies to sequence studies, categorize studies, and prioritize studies. Computer programs were written to assist the user in implementing the methodologies. Additionally, a data base was developed for storage of information concerning Army Command and Control System studies.

As this project evolved, it became necessary to reconsider the level of implementation (Army-wide versus MACOM level). The alternatives considered are discussed and the level of implementation chosen is detailed.

Documentation of the proposed program is contained in a proposed DA pamphlet and suggested changes to the existing AR 11-39. This documentation is contained in appendixes L and M of this technical document and represents the main product of the ACCSAI project.

SUMMARY

1. Introduction.

a. The Army Command and Control System Analysis Integration (ACCSAI) project was initiated in 1985 to develop a program to manage ACCS studies across the Army. Also to be addressed was the integration of tool development and data gathering with study conduct to help ensure the availability of required tools/data in time for use in a study. The ACCSAI project was jointly initiated by the Office of the Under Secretary of the Army, Operations Research (ODUSA (OR)) and Combined Arms Combat Developments Activity, Command, Control, Communications, and Intelligence (CACDA, C3I).

b. The ACCSAI project sponsor was ODUSA (OR). The project monitor was TRADOC Deputy Chief of Staff for Combat Developments (DCSCD). The study agency was CACDA, C3I, and the analytical support agency was TRADOC Analysis Center-Fort Leavenworth (TRAC-FLVN), Studies and Analysis Directorate (SAD), Command Control Analysis Division (CCAD). The study was supported by a study advisory group (SAG) which met three times. The SAG was chaired by the TRADOC DCSCD.

2. Purpose. The purpose of the ACCSAI project was to develop and recommend a management program and an accompanying management structure to enhance the quality of Army Command and Control System (ACCS) analysis by ensuring analysis integration and coordination throughout the Army.

3. Discussion.

a. Background.

(1) The ACCSAI project had a dual beginning:

(a) In January 1985, C3I, CACDA, developed the Five-Year ACCS Analysis Master Plan. The plan was developed to provide internal planning and management of ACCS studies. It was soon expanded to integrate ACCS analytical efforts of other activities at Fort Leavenworth. The plan was to be monitored by the recently formed CAC C3I steering committee.

(b) On 11 April 1985, the DUSA (OR) issued a memorandum to the commanders of TRADOC and AMC regarding C3I analysis. The most significant finding stated that Army C3I analytical work does not appear to have any overall direction.

(2) The two initiatives were brought together when it was determined that an Army-wide program would be extremely beneficial.

b. Problem. The following problem was addressed by the ACCSAI project.

(1) ACCS analytical work has little overall direction and coordination throughout the Army. This is due to the lack of specific ACCS program guidance on which to base an analysis work program and a lack of communications within and among MACOMs.

(2) This problem is acute within the ACCS program because ACCS issues cross all functions of the Army.

(3) The following specific problems in ACCS analysis management have adversely affected the quality of the ACCS analysis program:

(a) The lack of a structured methodology by which DA guidance may dynamically affect ACCS analysis preplanning.

(b) The lack of centralized control in the management of ACCS analysis and analysis preplanning.

(c) The lack of organization of ACCS analysis requirements from throughout the Army, and the lack of a systematic merging of those analysis requirements with tool creation and data collection efforts. Specific problems include the absence of the following:

1. Requests for ACCS analysis requirements far enough in advance to allow preplanning.

2. Scrutiny of requested ACCS analyses to eliminate duplications and voids (per DA guidance).

3. Sequencing of proposed ACCS studies to facilitate the availability of necessary analysis results (from primary studies) necessary for follow-on studies.

4. DA prioritization of proposed ACCS studies to ensure that the studies most crucial to the Army are addressed.

5. Scheduling of ACCS studies to best use the resources of analysis agencies and contracting funds.

6. Scheduling of both data collection (during tests and exercises) and tool creation to ensure their availability for use in the conduct of ACCS studies.

7. Dissemination of ACCS analysis information to facilitate interaction between and among proponents and analysis agencies.

8. Concise instructions for study proponents to expeditiously process ACCS study requirements.

c. Objectives. The objective of the ACCSAI project was to develop an ACCSAI management program and accompanying management structure which would be recommended as a solution to the stated problem. The ACCSAI management program and structure were to make maximum use of existing programs, structures, and systems. The ACCSAI management program was required to integrate ACCS analyses, tools, and data collection efforts through the channels of the management structure.

d. Methodology.

(1) General. Figure S-1 diagrams the ACCSAI project.

(2) Project procedures. A short description of each step in the methodology follows.

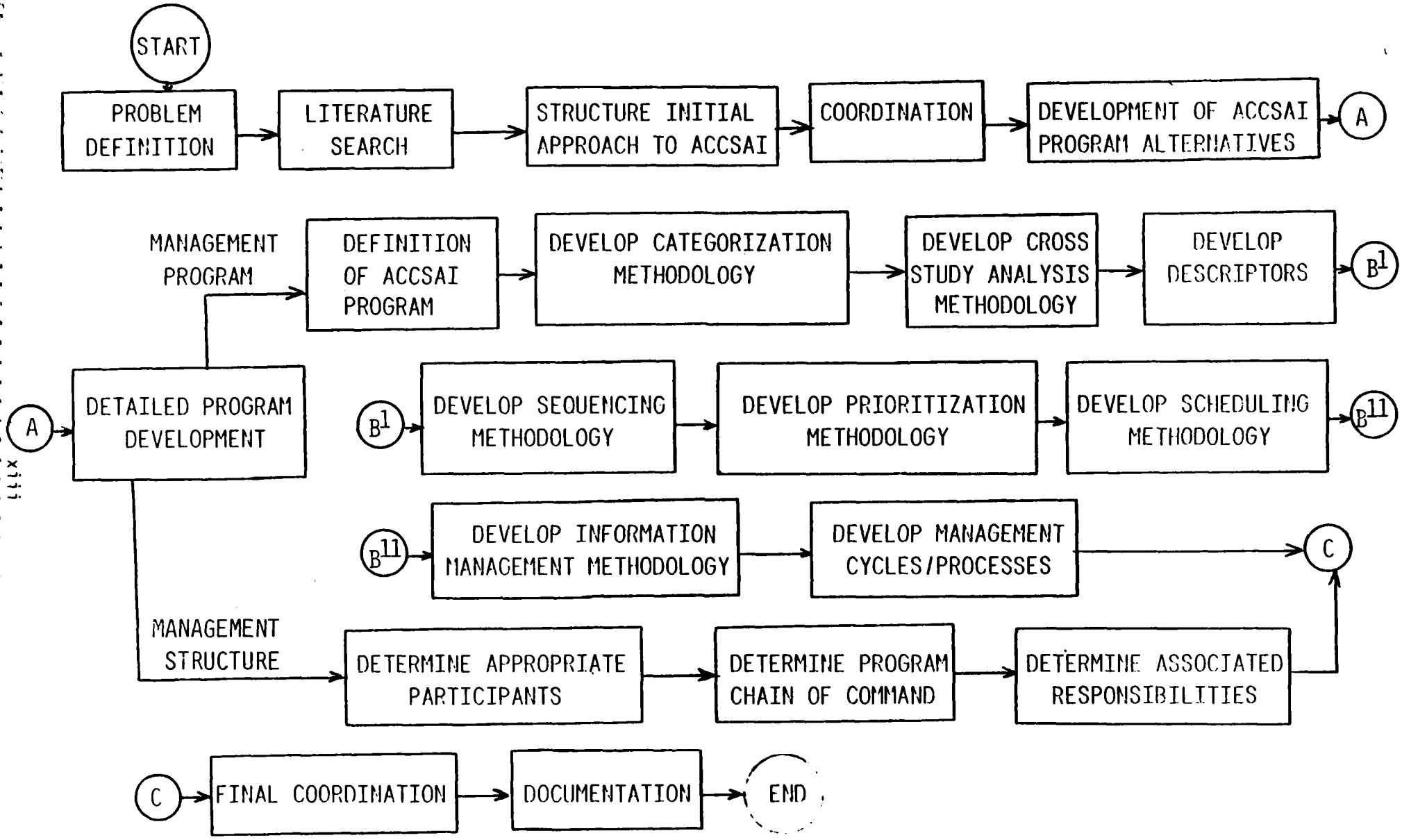


Figure S-1. ACCSAI project methodology

(a) Problem definition. Using documents referencing the ACCSAI problem, interviews of experts within the ACCS field, and in-house experience, a detailed problem statement was developed.

(b) Literature search. A literature search was conducted to determine which existing methodologies could be used in the ACCSAI program.

(c) Structure initial approach to ACCSAI. Using information gathered through the literature search and a preliminary analysis of the objectives and situation, an initial method for solving the ACCSAI problem was drafted. This original ACCSAI program strawman would be used for coordination purposes.

(d) Coordination. Team members coordinated with potential ACCSAI program participants to gain support, to inform, to gather suggestions, to survey program output requirements, to assess resistance to the program, and to alert them to their responsibilities in the program.

(e) Development of alternatives. Due to the response received during coordination concerning the draft ACCSAI program, three ACCSAI program alternatives were developed. Each alternative had somewhat unique methods for the management structure, annual cycles, and technical methodologies for sequencing, prioritizing, and scheduling ACCS study requirements. Because of the uniqueness of the methods involved in each of the ACCSAI program implementation alternatives, an alternative had to be chosen before finalizing the project. The decision was made at the project midpoint SAG meeting.

(f) Detailed ACCSAI program development. After the ACCSAI program alternative was chosen by the SAG, the methods involved in the program were finalized.

1. Management Program.

a. Definition of ACCSAI program studies. A clear definition of the studies to be included in the ACCSAI program was essential to the further development and success of the program.

b. Categorization. ACCS analysis, tool, and data categorical divisions had to be determined to assist in the management of the studies. Categories would help sequence studies, as well as identify voids and duplicative efforts. Categories would also help proponents and analysis agencies conduct literature searches. Categories were developed, tested on previously available trial data, and refined.

c. A cross-study comparison analysis. A method was developed for identification of voids and duplication in tools and data and to identify voids, similarities, and duplications in studies.

d. Develop descriptors. Descriptors were developed which would assist in the categorization process. The study proponents would describe each study using the applicable descriptors. Those descriptors would then indicate to the ACCSAI program office how each study should be categorized.

e. Sequencing. No existing methodologies adequately satisfied the needs of the ACCSAI project for sequencing. A methodology was developed. The methodology was refined after using trial data.

f. Prioritization. For the study prioritization methodology, alternative methodologies were discovered through a literature search and through discussions with in-house experts and other Army experts. The modified eigenvector method was selected.

g. Scheduling. Scheduling deals with setting an appropriate time for the conduct of a study as well as determining the appropriate analysis agency. A method for scheduling was determined which used priorities, sequences, analysis agency missions/capabilities, suspense, and manyears of effort to schedule each study.

h. Information management. As the project developed it became obvious the program would need to effectively administrate large amounts of data. The administration of the data would include a method of gathering data (on studies, tools, required data analysis agency capability) and a method to effectively and efficiently reference and manipulate the data. To facilitate data gathering, various input sheets were developed. A data base was designed to help manage information. Database design experts were consulted, existing/available DBMSs and hardware were reviewed, and the most applicable DBMS and hardware were selected. (These structures had to facilitate the categorization, storage, and retrieval processes.) The data base was created.

i. Management cycles/processes. To ensure an integrated and orderly procession of events in the management of ACCS studies, it was necessary to determine an annual cycle that would be in sync with already existing programs (such as AR 5-5). A quick-response cycle was also developed for studies which, because of their late identification and high priority, could not be processed through an annual cycle.

2. Recommended management structure. The management structure for the ACCSAI program includes three portions: the participants, the chain of command, and the responsibilities associated with the program.

a. Participants. The participants determined necessary for this program are as follows: DA ODCSOPS, DA OACSIM, the ACCS SC/WG, a program office and tool/data office from each MACOM, ACCS study proponents, and analysis activities.

b. Chain of command. Various structures for the management of the program were developed and coordinated with the participants.

c. Responsibilities. Each participant has responsibilities within the ACCSAI program. As the management structure developed, these responsibilities became finalized.

(g) Final coordination. Coordination with SAG members concerning the proposed ACCSAI management structure and ACCSAI methodologies to obtain their comments and approval was a vital step.

(h) Documentation. The methodology developed and used is documented in this TRAC technical document TRAC-F-TD-2587. The program developed through this project is documented in the proposed DA Pam XX-XX and in a list of proposed changes to AR 11-39. This program documentation is also published in appendixes L and M.

4. Conclusions.

a. The product resulting from this study is the proposed program documented in DA Pam XX-XX and proposed changes to AR 11-39. These documents are published in this TRAC technical document.

b. The proposed DA Pam XX-XX outlines:

(1) The types of studies to be included in the Army Command Control System Analysis Integration (ACCSAI) program.

(2) The responsibilities of the participants in the ACCSAI program, the schedules and cycles involved with the ACCSAI program, and all necessary forms and instructions for participation in the ACCSAI program.

c. The material in the proposed DA Pam XX-XX is intended to:

(1) Act as a guide to the management components of the ACCSAI program for the maintenance of the ACCSAI program.

(2) Educate the action officer regarding the Army management requirements associated with the initiation, conduct, and termination of studies concerning the Army Command and Control System.

(3) Assist the action officer with the fulfillment of the Army management requirements referred to above.

5. Recommendation. Recommend the implementation of the ACCSAI program as documented in proposed DA Pam XX-XX and proposed changes to AR 11-39.

Chapter 1

INTRODUCTION

1-1. Purpose. The purpose of this document is to describe the Army Command and Control System (ACCS) Analysis Integration (ACCSAI) project. The purpose of the ACCSAI project was to develop and recommend a management program and an accompanying management structure to enhance the quality of Army Command and Control System (ACCS) analysis by ensuring analysis integration and coordination throughout the Army.

1-2. Presentation method. To facilitate understanding of this document, a description of the outline of the document follows.

a. Chapter 1 provides a description of the history of the initiation of the ACCSAI project.

b. Chapter 2 briefly describes the results of the study. The product of the ACCSAI project is a proposed management program called the ACCSAI program. Chapter two provides a brief overview of the ACCSAI program.

c. A short description of each step of the project is provided in chapter 3. The chapter 3 "nutshell" presentation of the entire project is to assist the reader in following the remainder of the main report (which describes in more detail, and provides the results of, each project step).

d. Chapter 4 describes, in detail, the first four steps in the project methodology. Chapter 4 presents the definition of the ACCSAI problem, a description of the initial ACCSAI program strawman (which was used for coordination purposes), the development of the three ACCSAI program alternatives, and the rationale used by the SAG to choose the recommended alternative.

e. Chapter 5 presents a detailed explanation of the development of the methodologies for study management (to include study categorization, cross-study comparison, study sequencing, study prioritization, and study scheduling) and tool/data management. Also contained in chapter 5 is a description of how the definition of ACCSAI studies was developed.

f. The development of the information management processes is described in chapter 6. Information management includes: the forms used to gather and disseminate information; the organizations responsible for information management; and the automated processes involved in information management.

g. The administrative appendixes are lettered A through F. The titles of the appendixes sufficiently describe their contents.

h. The technical appendixes are lettered G through K. The technical appendixes provide technical guidance to the ACCSAI program offices and tool/data offices. Appendix G presents the mathematics supporting the recommended prioritization methodology. Appendixes H through K provide user and technical documentation for all supporting software developed in-house for the ACCSAI program.

i. The product of the ACCSAI project, the ACCSAI program, is documented in appendixes L and M. Appendix L is the proposed DA pamphlet describing the ACCSAI program. Appendix M is a list of the proposed changes to AR 11-39 (The ACCS Program).

1-3. Problem. The following problem was addressed by the ACCSAI project.

a. ACCS analytical work has little overall direction and coordination throughout the Army. This is due to the lack of specific ACCS program guidance on which to base an analysis work program and a lack of communications within and among major commands (MACOMs).

b. This problem is acute within the ACCS program because ACCS issues cross all functions of the Army.

c. The following specific problems in ACCS analysis management have adversely affected the quality of the ACCS analysis program.

(1) The lack of a structured methodology by which DA guidance may dynamically affect ACCS analysis preplanning.

(2) The lack of centralized control in the management of ACCS analysis and analysis preplanning.

(3) The lack of organization of ACCS analysis requirements from throughout the Army, and the lack of a systematic merging of those analysis requirements with tool creation and data collection efforts. Specific problems include the absence of the following.

(a) Requests for ACCS analysis requirements far enough in advance to allow preplanning.

(b) Scrutiny of requested ACCS analyses to eliminate duplications and voids (per DA guidance).

(c) Sequencing of proposed ACCS studies to facilitate the availability of necessary analysis results (from primary studies) required for follow-on studies.

(d) DA prioritization of proposed ACCS studies to ensure that the studies most crucial to the Army are addressed.

(e) Scheduling of Army Command and Control System (ACCS) studies to best use the resources of analysis agencies and contracting funds.

(f) Scheduling of both data collection (during tests and exercises) and tool creation to ensure their availability for use in the conduct of ACCS studies.

(g) Dissemination of ACCS analysis information to facilitate interaction between and among proponents and analysis agencies.

(h) Concise instructions for study proponents to expeditiously process ACCS study requirements.

1-4. Background.

a. The ACCSAI project had a dual beginning.

(1) In January 1985, C3I, Combined Arms Combat Development Activity (CACDA), developed the Five-Year ACCS Analysis Master Plan (FAAMP). The plan was developed to provide internal planning and management of ACCS studies. It was soon expanded to integrate ACCS analytical efforts of other activities at Fort Leavenworth. The plan was to be monitored by the recently formed Combined Arms Center (CAC) C3I steering committee.

(2) On 11 April 1985, the Deputy Under Secretary of the Army (Operations Research) (DUSA (OR)) issued a memorandum to the commanders of the United States Army Training and Doctrine Command (TRADOC) and the United States Army Materiel Command (AMC) regarding C3I analysis. The most significant finding stated that Army command, control, communications, and intelligence (C3I) analytical work does not appear to have any overall direction.

b. When the two initiatives were brought together, it was determined that an Army-wide program would be extremely beneficial. Some of the principle desires of the evolving program were:

(1) Long-term DA guidance on an annual basis to MACOMs for development of the ACCS program (AR 11-39).

(2) A management structure and processes to identify and eliminate duplicate studies and voids in ACCS analyses.

(3) A single-source "cookbook" for study proponents to initiate, conduct, and terminate ACCS studies.

(4) Long-term forecasting of studies to permit analysis agencies to program resources and to build tools and gather data in a timely manner.

1-5. Objectives. The objective of the ACCSAI project was to develop an ACCSAI management program and accompanying management structure which would be recommended as a solution to the stated problem. The ACCSAI management program and structure were to make maximum use of existing programs, structures, and systems. The ACCSAI management program was required to integrate ACCS analyses, tools, and data collection efforts through the channels of the management structure. Distinct objectives for the ACCSAI program/management structure were as follows.

a. It must ensure that important areas in ACCS are addressed.

b. It must determine the requirements to eliminate ACCS tool/data deficiencies.

c. It must prioritize ACCS studies with emphasis on benefits to the entire Army.

d. It must ensure no duplication in ACCS analysis and tool development.

e. It must schedule ACCS studies, tool creation, and data collection efforts such that prerequisites for a study are completed before the study begins.

f. It must result in a single document that describes the ACCS analysis program and management structure, and it must provide a single source of instructions and forms to initiate, conduct, and terminate ACCS analyses.

g. The structure must provide effective leadership for the program.

1-6. Scope. The ACCSAI project (and resulting recommended program) addresses all Army-wide ACCS issues, ACCS analyses, ACCS tests, and ACCS exercises. Thus, friendly issues (sustaining base, strategic, operational, and tactical) and ACCS issues across all functions (fire support, air defense, intelligence and electronic warfare (IEW), aviation, command and control (C^2), etc.) are addressed.

1-7. Limitations. The project was limited to developing an ACCSAI management program. Implementation of the program was not included.

CHAPTER 2

PROJECT RESULTS - THE ACCSAI PROGRAM

2-1. Program overview. A brief description of the results of the ACCSAI project is provided here. The below described program is the product resulting from the project described within the remainder of this technical document. The chapters following will describe, in detail, the project approach as well as the technical methodologies involved.

2-2. ACCSAI program operations.

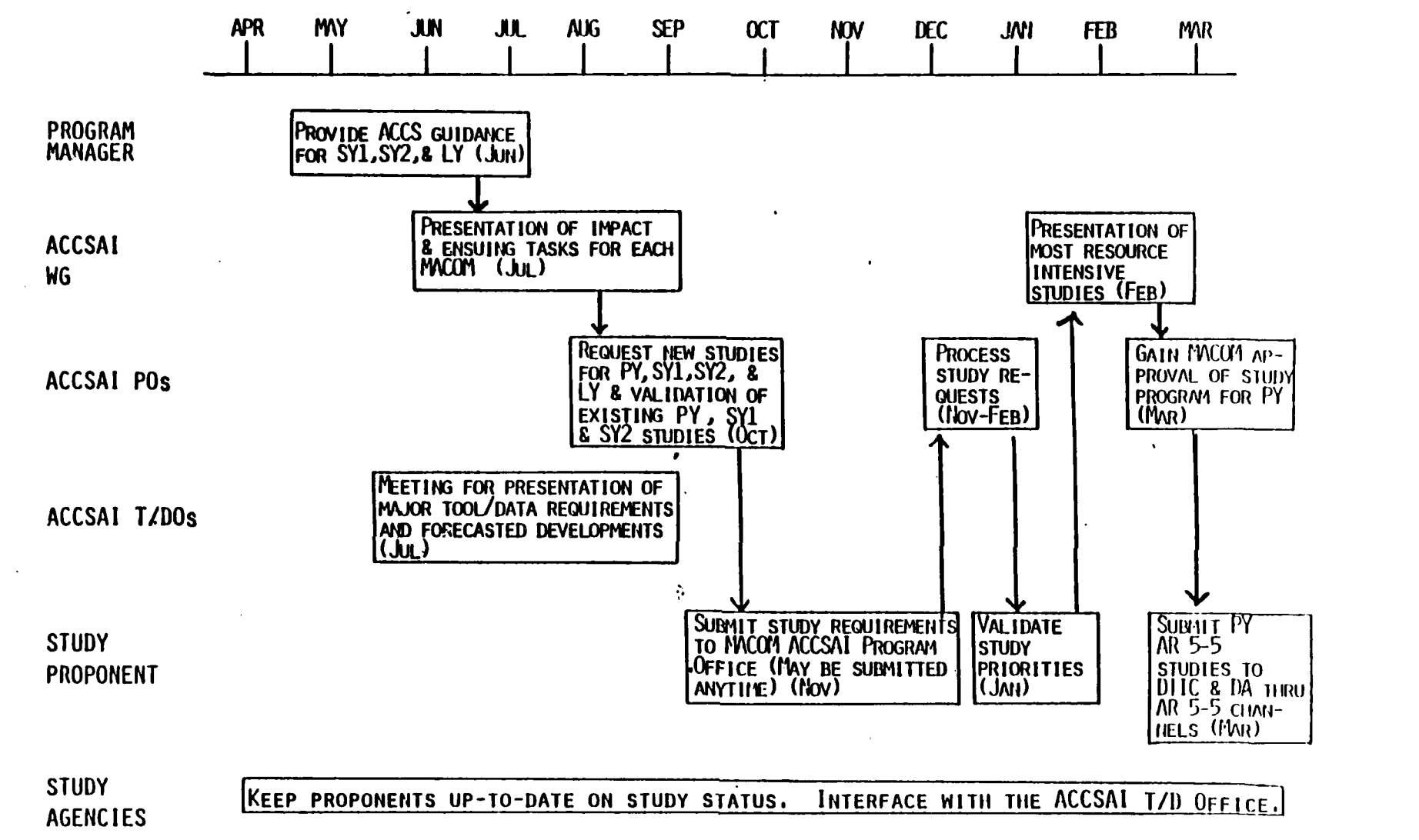
a. The DA Office of the Deputy Chief of Staff for Operations and Plans (ODCSOPS) publishes guidance concerning the future direction of the Army Command and Control System. The guidance serves as the impetus for the generation of new ACCS study requirements by acting as the template against which present/future capabilities and presently identified ACCS study requirements may be compared.

b. As ACCS study requirements are identified, they are initiated by their proponent. Depending on the type of study, deliberate or quick response, the following procedures are followed.

(1) Deliberate (studies which, by their early identification, allow preplanning and prescheduling (figure 2-1)). Prior to submission of any ACCS study request, the proponent must conduct a preliminary literature search of both the Defense Technical Information Center (DTIC) and the Army Command and Control System Study and Tool/data Schedule (ACCS STATS). ACCS STATS is accessible through each major command (MACOM) ACCSAI program office. The proponent then submits the study requirements to the MACOM ACCSAI program office, through the use of DD Form 1498, a study directive, and an ACCSAI attachment form to DD Form 1498. Studies should be submitted four years in advance or as soon as they are identified. The large lead time enhances study quality by ensuring that tools/data are available when needed, the studies are integrated with other study requirements, and the study will be completed by the requested time. However, studies may be submitted at any time prior to their requested start date and the ACCSAI program has the capability to rapidly assimilate quick-response-type studies.

(2) Quick-response (studies which, because of their late identification and priority for immediate conduct and completion, require out-of-cycle scheduling (figure 2-2)). Upon the identification of a quick-response-type study, the proponent conducts a literature search of both DTIC and ACCS STATS. After determining a nonduplicative nature to the study requirement, the proponent notifies the MACOM ACCSAI program office through either a phone call or the submission of a DD Form 1498 and an ACCSAI attachment form to DD Form 1498.

c. Each MACOM ACCSAI program office processes the ACCS study requests. Processing involves various procedures, also dependent upon the type of study. ACCSAI program offices are responsible for the following processes.



CY = Current Study Year.

PY = Program Year (CY+1). Studies are programmed for conduct in the PY during the March of the CY.

SY1 = Schedule Year One (CY+2). Studies are preliminarily scheduled according to conduct time and analysis agency.

SY2 = Scheduled Year Two (CY+3). Studies are preliminarily scheduled according to conduct time and analysis agency

LY = List Year (CY+4). Studies are retained within ACCS STATS for reference purposes.

FY = Fiscal Year.

Figure 2-1. ACCSAI program annual cycle

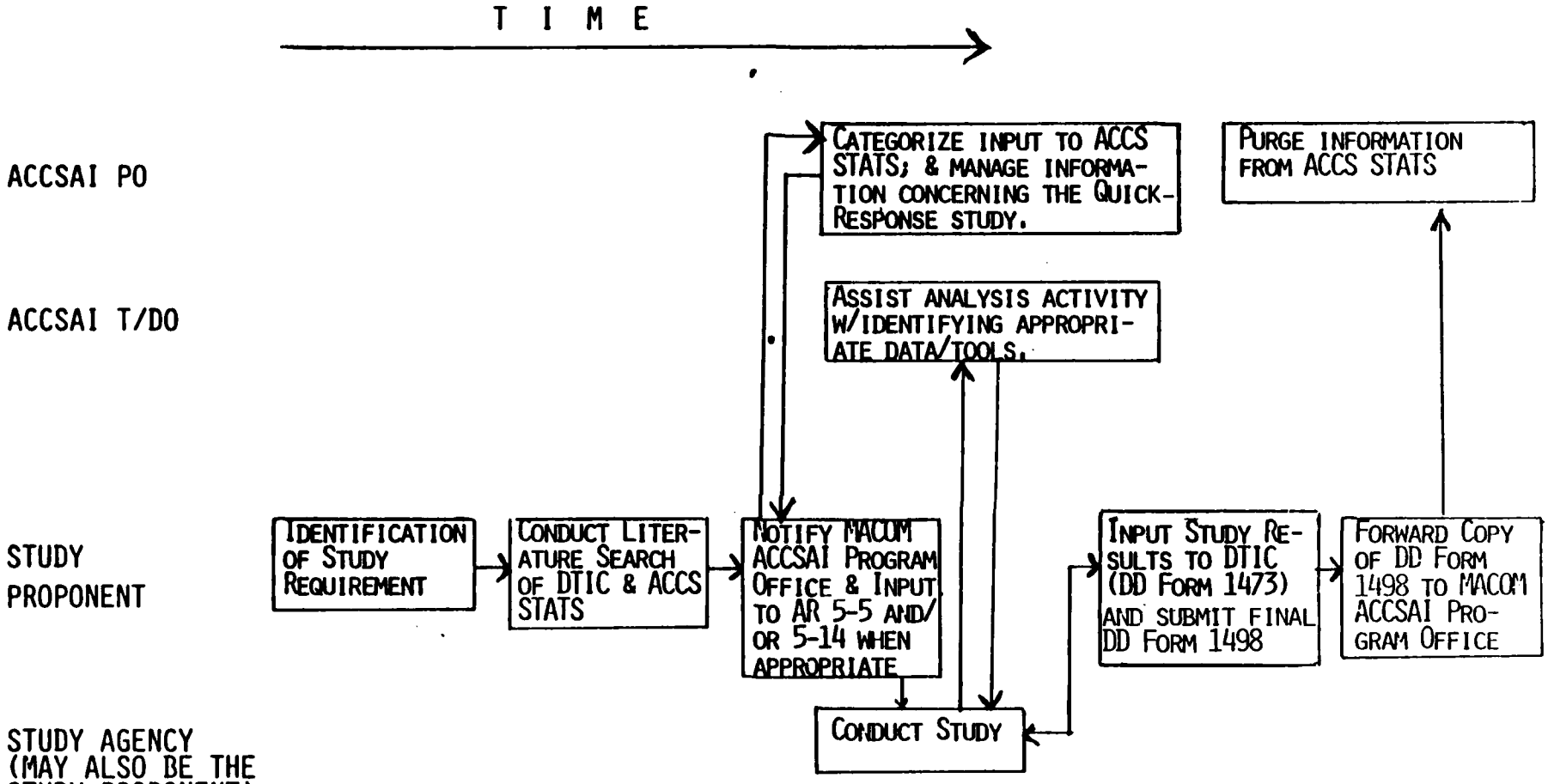


Figure 2-2. Reporting procedures for quick-response studies

(1) Deliberate studies. ACCSAI program offices are responsible for categorizing, sequencing, prioritizing, and scheduling studies. (Prioritization of deliberate study requests will be approved by representatives of the proponents.) Scheduling involves the setting of a date for the conduct of the deliberate study as well as the determination of the appropriate analysis agency. (Some MACOMs have study programs other than the ACCSAI program which will determine the analysis agency. The ACCSAI program will not usurp the responsibilities of these existing programs and study proponents must ensure that they go through all appropriate channels for study initiation, conduct, and termination.) Deliberate studies are programmed for conduct one year in advance. They are tentatively scheduled two and three years in advance of conduct. All studies are categorized, listed, and used for reference. All information concerning ongoing and projected studies is retained within each MACOM's ACCSAI program office in Army Command and Control System Studies and Tool/data Schedule (ACCS STATS), an automated data base.

(2) Quick-response studies. The ACCSAI program offices are responsible for categorizing quick-response studies, searching for duplications in study efforts, and maintaining information concerning quick-response studies in ACCS STATS.

d. All ACCS studies which qualify for the AR 5-5 or AR 5-14 study program must be submitted by the proponent to Department of the Army through the appropriate AR 5-5 and AR 5-14 channels upon the programming of those studies through the ACCSAI program. At the same time, the programmed AR 5-5 and AR 5-14 studies must be submitted to DTIC.

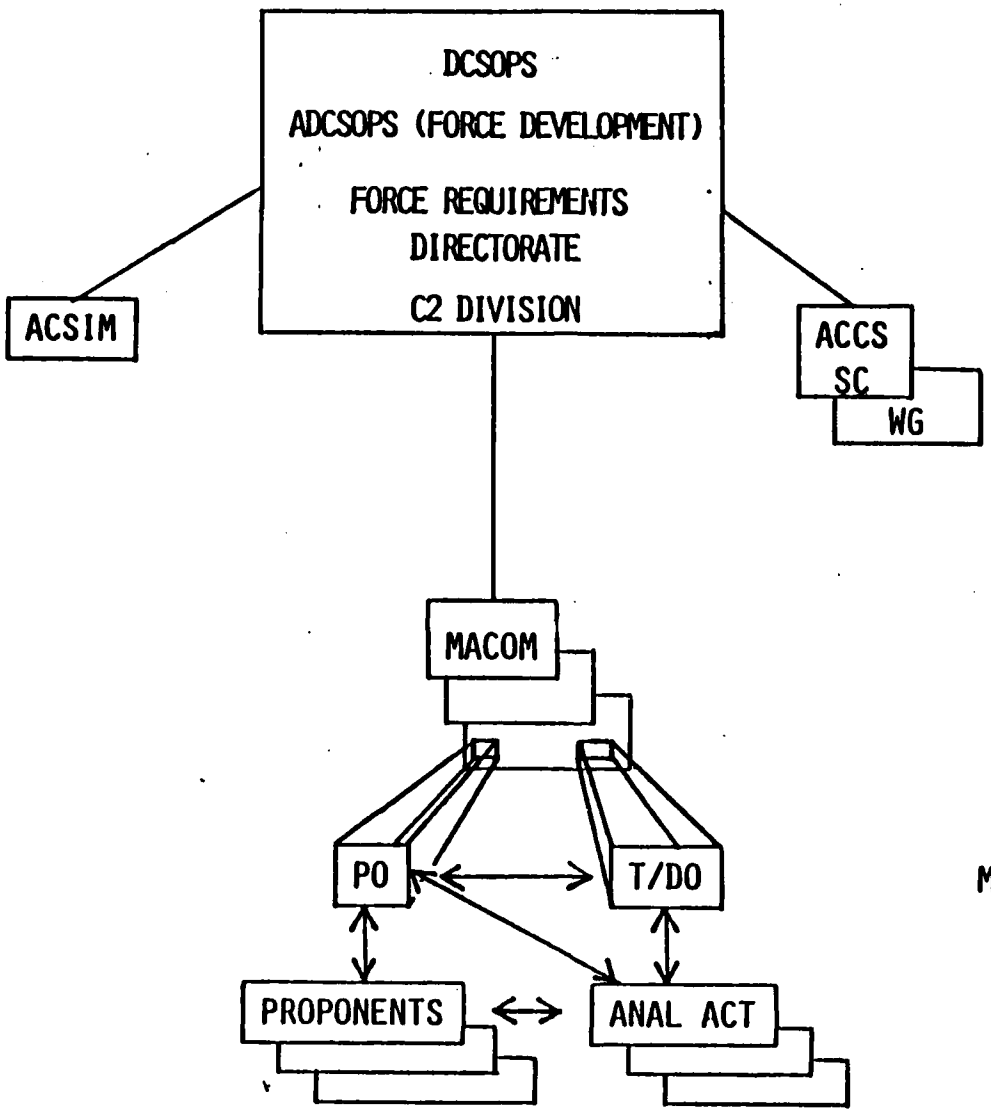
e. Organizations performing ACCS studies must contact the MACOM ACCSAI program tool/data office as soon as they are scheduled to perform a study in order to coordinate the acquisition of necessary tools and data. The analysis organizations are also responsible for keeping the proponent updated on the status of the study.

f. Proponents are responsible for submitting updates of studies to their MACOM's ACCSAI program office as well as to DTIC (if the study is AR 5-5 or AR 5-14). The completion of <u>all</u> studies must be reported to DTIC and to the proponent MACOM's ACCSAI program office.

g. For technical details concerning the prioritization methodology and software documentation, reference the technical appendixes of this technical document.

2-3. <u>ACCSAI program management structure</u>.

a. Figure 2-3 represents the management structure associated with the ACCSAI program. Associated responsibilities are outlined in paragraph 2-3b.



MACOMS:
- TRADOC*
- AMC **
- ISC
- INSCOM
- USAREUR
- FORSCOM
- WESTCOM
- EUSA

*ACCSAI STUDY EXECUTIVE AGENT

**ACCSAI TOOL/DATA EXECUTIVE AGENT

Figure 2-3. ACCSAI program management structure

b. Program responsibilities.

(1) DA ODCSOPS.

(a) Provide annual futuristic guidance concerning the development of the ACCS program and ACCS analysis.

(b) Ensure program conformance.

(c) Chair the ACCSAI steering committee (SC) and working group (WG).

(d) Manage the ACCSAI program and keep the program viable.

(2) ACCS steering committee (ACCS SC). (Chaired by ODCSOPS. Members include the DUSA(OR) and representatives from each MACOM). The ACCS SC will be called upon only when issues cannot be resolved by the ACCS WG.

(3) ACCS working group (ACCS WG). (Chaired by ODCSOPS. Members include the ODUSA(OR) and representatives from each MACOM). Meet annually to:

(a) Identify MACOM-specific ACCS issues.

(b) Resolve conflicts concerning duplicate efforts across the MACOMs, as identified by TRADOC program offices and the AMC tool/data office.

(c) Identify noncompliance to the ACCSAI program.

(4) ACCSAI program office (ACCSAI PO) (at each MACOM).

(a) Act as the MACOM clearing house for all study requirements. Tasks include: gather and manage information concerning all ACCS study requirements, both deliberate and quick response; identify and eliminate duplicate efforts; sequence, prioritize, and schedule deliberate studies to be done within the next three years; and maintain information concerning quick-response and deliberate studies in ACCS STATS. (Reference the technical appendixes of this technical document for documentation of methodologies to be employed as well as software documentation and computer hardware specifications.)

(b) Schedule deliberate studies to reflect the appropriate analysis agencies.

(c) Maintain an automated reference inventory of all projected and ongoing studies and projects within the MACOM, identifying, for each study, the following information (where appropriate): proponent, analysis agency POCs, description codes, status, start date, end date, sequence, priority, decision maker, and decision to be made. The automated reference inventory is referred to as the ACCS STATS. (For technical details concerning database design, reference appendix K of this document.)

(d)* Delivers semiannual information concerning programmed, scheduled, ongoing, and listed (forecasted) studies to the central ACCS STATS data base. (This encompasses all studies and study requirements currently in the ACCSAI program office's data base.)

(e)** Semiannually disseminates consolidated information concerning programmed, scheduled, ongoing, and listed (forecasted) studies to all MACOMs. (This is a consolidated version of what was sent in (d), above.)

(f)** Identifies duplicate studies across MACOMs and coordinates with the organizations involved to eliminate those duplications. (The ACCS working group will resolve conflicts.)

(g) Ensures use of ACCS STATS and DTIC for literature search through the education of individuals involved in ACCS studies.

(h) Chairs annual meeting of study proponents to validate deliberate study prioritization.

(5) ACCSAI program tool/data office (ACCSAI T/DO) (each MACOM).

(a) Assists MACOM ACCS analysis organizations with forecasting and scheduling ACCS tool/data requirements (to ensure no duplication and timely availability of necessary tool/data), based on programmed and scheduled studies within the AR 5-5, AR 5-14, and the ACCSAI program.

(b) Assists MACOM ACCS analysis organizations in procuring input data from governmental and commercial sources to support future ACCS studies within the AR 5-5, AR 5-14, and the ACCSAI program.

(c) Maintains an automated reference inventory of ACCS models, data bases, and scenarios. The automated data base (ACCS STATS (tools)) will contain information concerning the origin, current status, existing documentation, expertise within MACOM, past applications, and future status of the tool/data. (Reference appendix K this document for data base design and hardware specifications.)

(d) Coordinates across MACOMs to other ACCSAI program tool/data offices as required on a case-by-case basis for specific tools/data.

(e) Coordinates with the MACOM ACCSAI program office for purposes of ensuring timely tool/data availability for use in ACCS studies as required on a case-by-case basis for specific tools/data.

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*All MACOMs except TRADOC
**TRADOC only

(f)+ Annually delivers information concerning available and projected models, data bases, and data to the consolidating ACCS STATS (tools) office for incorporation into the consolidated data base.

(g)++ Annually disseminates consolidated information concerning available and projected ACCS models, data bases, and data to all MACOMs.

(h)++ Identifies duplicate tool developments across the MACOMs and coordinates with the organizations involved to eliminate those duplications. (The ACCS WG will resolve conflicts.)

(j) Meet annually to discuss major tool/data requirements and forecasted developments.

(6) ACCS study proponents.

(a) Conduct literature searches of both DTIC and ACCS STATS before initiating any study.

(b) Submit all study requirements, both deliberate and quick-response, to the MACOM ACCSAI program office (reference the proposed DA Pam XX-XX, The ACCS Analysis Integration Program, appendix L).

(c) Submit the appropriate ACCS studies to the AR 5-5 and AR 5-14 program after the studies are programmed under the ACCSAI program.

(d) Submit all AR 5-5 and AR 5-14 studies to DTIC at the following times: upon submission of the study to the AR 5-5 and/or AR 5-14 studies program, whenever a major change to the study occurs, and upon study completion.

(e) Submit all non-AR 5-5/AR 5-14 studies to DTIC (both deliberate and quick-response) upon completion.

(f) Submit study updates to the MACOM ACCSAI program office for all studies with major changes.

(g) Submit copy of final DTIC form (DD Form 1498) to the MACOM ACCSAI program office when a deliberate or quick-response study has been completed.

(h) Submit a copy of the study report and a DD form 1473 through the appropriate channels when documentation is complete.

(i) Attend annual ACCS study prioritization meeting to validate study priorities.

+All MACOMs except AMC
++AMC only

(7) ACCS analysis organizations (all organizations performing ACCS studies).

(a) Conduct literature searches of both DTIC and ACCS STATS at the outset of any study.

(b) Submit tool/data requirements to ACCSAI program tool/data office.

(c) Keep appropriate proponents updated on the status of studies.

(d) Submit follow-on study requirements to proponents.

(e) Submit an AR 5-5 study requirement to develop an ACCS analysis model/tool (AR 5-5) as required.

2-4. ACCS program details. For further details concerning the ACCSAI program, reference the program documentation in appendixes L and M.

CHAPTER 3

PROJECT METHODOLOGY - AN OVERVIEW

3-1. General. The general approach employed throughout the ACCSAI project to develop the ACCSAI program is illustrated at figure 3-1.

3-2. Project procedures. A short description of each step in the methodology follows. Detailed descriptions of the project steps, as well as the results, are described in chapters 4, 5, 6, and 7.

a. Problem definition. Using documents referencing the ACCSAI problem, interviews of experts within the ACCS field, and in-house experience, a detailed problem statement was developed. Though the wording of the problem statement was modified throughout the project, the meaning stayed essentially the same.

b. Literature search. A literature search was conducted to determine which existing methodologies could be used in the ACCSAI program. DTIC and the Defense Logistics Studies Information Exchange (DLSIE) were used to obtain documentation on these methodologies.

c. Structure initial approach to ACCSAI. Using information gathered through the literature search and a preliminary analysis of the objectives and situation, an initial method for solving the ACCSAI problem was drafted. The draft ACCSAI program included: a management structure; annual cycles; methods for gathering study requirements; and methods for sequencing, prioritizing, and scheduling study requirements.

d. Coordination. After the initial ACCSAI program strawman was developed, team members coordinated with potential ACCSAI program participants to gain support, to inform, to gather suggestions, to survey program output requirements, to assess resistance to the program, and to alert them to their responsibilities in the program. Points of contact (POCs) were established in the ODUSA (OR), Joint Analysis Directorate (OJCS), Air Force studies and analyses, ODCSOPS, CAA, OTEA, ODCSPER, OACSIM, OACSI, ODCSRDA, HQ TRADOC, CAC Threats, CACDA C3I, CATA, TCATA, TRAC-FLVN, TRAC-WSMR, AMMO, LOGC, SSC, HQ AMC, AMSAA, and HQ ISC. (Appendix F lists the POCs as they were represented in the SAG.)

e. Development of alternatives. Due to the response received during coordination concerning the draft ACCSAI program, three ACCSAI program alternatives were developed. Each alternative had somewhat unique methods for the management structure, annual cycles, and technical methodologies for sequencing, prioritizing, and scheduling ACCS study requirements. Because of the uniqueness of the methods involved in each of the ACCSAI program implementation alternatives, an alternative had to be chosen before finalizing the methodologies being developed. The decision was made at the project midpoint SAG meeting.

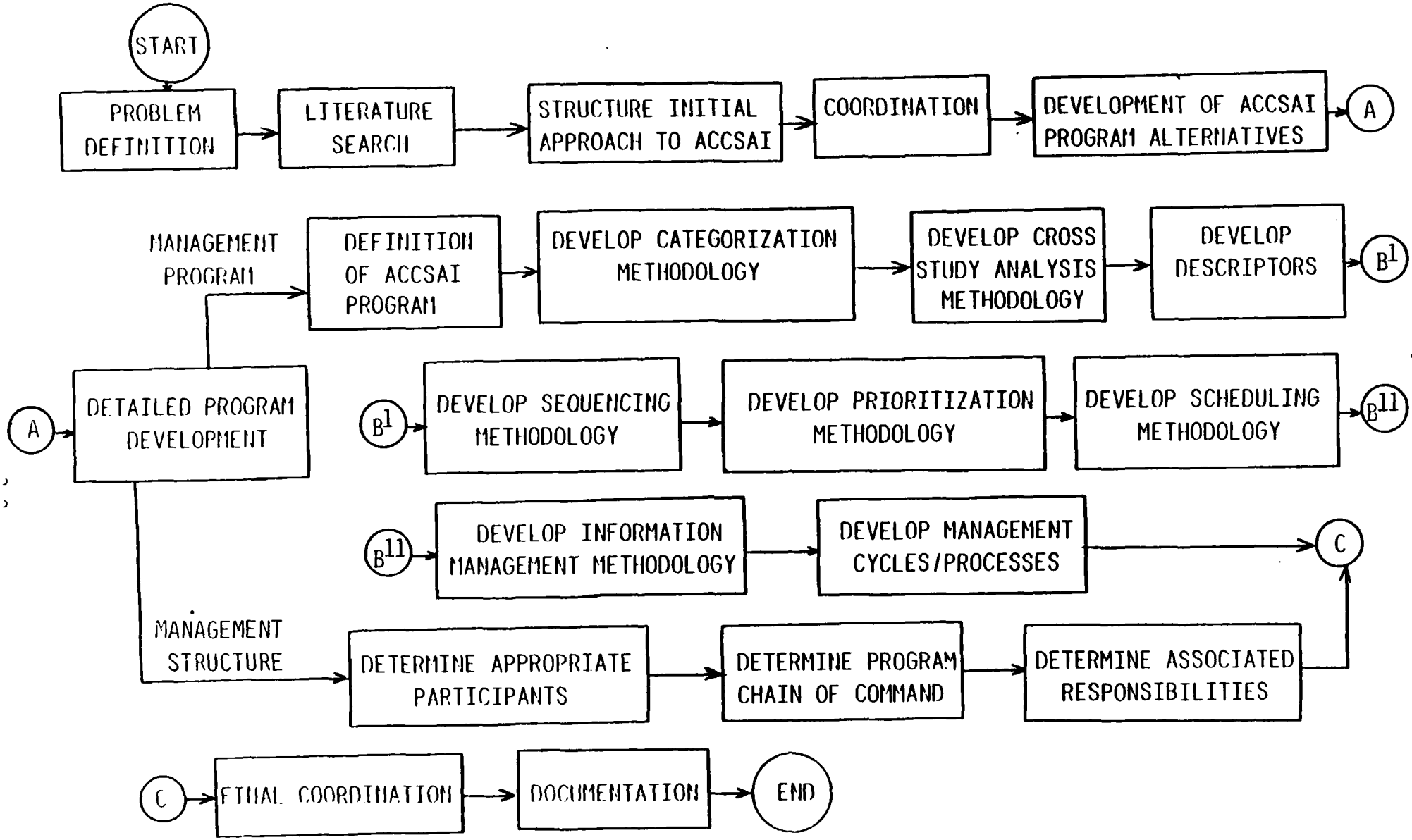


Figure 3-1. ACCSAI project methodology

f. Detailed ACCSAI program development. After the ACCSAI program alternative was chosen, the methods involved in the program were finalized.

(1) Management program.

(a) Definition of ACCSAI program studies. A clear definition of the studies to be included in the ACCSAI program was essential to the further development and success of the program. This definition included the definition of ACCS, the definition of a study, restrictions of the type of ACCS efforts to be included in the program, and a description of the two general categories of studies, quick-response and deliberate.

(b) Develop categorization methodology. ACCS analysis, tool, and data categorical divisions were necessary to assist in the management of the studies. Categories would help sequence studies as well as identify voids and duplicative efforts. Categories would also help proponents and analysis agencies conduct literature searches. Categorization documents were reviewed so as to give team members ideas concerning categorization for the project. Categories were developed, tested on previously available trial data, and refined. The categories were incorporated into the ACCS Studies and Tool/data Schedule (ACCS STATS) data base.

(c) Develop cross-study comparison methodology. The criteria for selection of the cross-study comparison methodology were determined. Cross-study comparison refers to the identification of voids and duplication in tools and data and the identification of voids, similarities, and duplications in studies. The literature search yielded little information; the methodology was developed in-house.

(d) Develop descriptors. Descriptors were necessary to assist in the categorization process. These descriptors had to be key words which could be placed on the study initiation sheets. The study proponents would circle the applicable descriptors. Those descriptors would then indicate to the program office how the study should be categorized.

(e) Develop sequencing methodology.

1. The study sequencing methodology was the next item to be completed. The literature search gave examples of scheduling which assisted in the development of the recommended sequencing methodology. None of the existing methodologies adequately satisfied the needs of the ACCSAI project. A methodology was developed. The methodology was refined after using trial data.

2. The same process was used to determine the sequencing methodology for data collection and tool creation. The only addition was an in-depth search of Test Schedule and Review Committees (TSARCS) to determine how best to phase in tool and data requirements.

(f) Develop prioritization methodology. For the study prioritization methodology, alternative methodologies were discovered through a literature search and through discussions with in-house experts and other Army experts. The modified eigenvector method was selected (details are in chapter 7), input requirements were determined, and the prioritization methodology was documented.

(g) Develop scheduling methodology. Scheduling deals with setting an appropriate time for the conduct of a study as well as determining the appropriate analysis agency. A method for scheduling was determined which used priorities, sequences, analysis agency missions/capabilities, suspense, and manyears of effort to schedule each study.

(h) Develop information management methodology. As the project developed, it became obvious that the program would have to effectively administrate large amounts of data. The administration of the data would include a method of gathering data (on studies, tools, required data, and analysis agency capabilities) and a method to efficiently reference and manipulate the data.

1. Develop input collection methodology. Large amounts of data have to be gathered for the ACCSAI program to work. To facilitate data gathering, various input sheets were developed. Types of input sheets include: a study input sheet (used to describe the requirement for a study); a tool requirement sheet (used to describe required tools); a mission/capability input sheet (used to describe the capabilities of ACCS analysis agencies); and a study update sheet (to keep the status of the study current in the program office).

2. Develop data bases. At this stage, the team was ready to design data bases for use in the ACCSAI program. This process required reviewing the output requirements surveys which were received from the SAG members listed in appendix F. The surveys pinpointed the output needed from the data base. A report format was created to provide output and to facilitate its use. Available test data inputs were reviewed. Now that team members knew the output needed and the input available (descriptors, connectors, and attributes), a data base management system (DBMS) and hardware had to be selected. Data base design experts were consulted, existing/available DBMSs and hardware were reviewed, and the most applicable DBMS and hardware were selected. These structures had to facilitate the categorization, storage, and retrieval processes. The data bases were created. Previously available trial data were input so that test retrievals could be performed on the data bases. Then, the data base designs were refined.

(i) Develop management cycles/processes. To ensure an integrated and orderly procession of events in the management of ACCS studies, it was necessary to determine an annual cycle in synchronization with already existing programs (such as AR 5-5). For the case of studies which, because of their late identification and high priority, could not be processed through an annual cycle, a quick-response cycle was also developed.

(2) Recommended management structure. The management structure for the ACCSAI program includes three portions: the participants, the chain of command, and the responsibilities associated with the program.

(a) Determine appropriate participants. The participants determined necessary for this program are as follows: DA ODCSOPS, DA OACSIM, the ACCS SC/WG, a program office and tool/data office from each MACOM, ACCS study proponents, and analysis activities. This program requires the active participation of all organizations listed. They will provide vital input to the program concerning studies, data, and tools; they will determine which studies cannot be resourced; and they will receive the output from the program.

(b) Determine program chain of command. Various structures for the management of the program were developed and coordinated with the participants.

(c) Determine responsibilities. Each participant had responsibilities with the ACCSAI program. As the management structure developed, these responsibilities became finalized.

g. Final coordination. Throughout this project, lines of communication were kept open between team members and SAG members. (For a complete list, see appendix F.) A vital step was coordination with SAG members to obtain their comments and approval of the proposed ACCSAI management structure and ACCSAI methodologies.

h. Documentation. The program is documented in this final report. Team members developed modifications to existing ARs (see appendix M) and planned distribution of this final report. Should the ACCSAI management program be implemented, team members will establish consultative services to assist in its implementation.

CHAPTER 4

STUDY INITIATION, DEVELOPMENT OF ALTERNATIVES, AND ALTERNATIVE CHOSEN

4-1. Study initiation and problem definition.

a. The Army study program has become an item of interest and concern to the Congress and the Office of the Secretary of Defense. Areas of concern include the enormous cost of the study program, the amount of sole source contracting, inadequate study planning, poor records, improper reporting, and inadequate distribution of study results. In general, the overall management and use of the study program has become a concern.

b. Problems expressed above are particularly acute within Army Command and Control System (ACCS) analysis because ACCS issues cross all functions of the Army. The perception that a great deal of quality work was being done in the ACCS analysis area, but that much of it was out of the mainstream of the decision process (as seen by HQDA), prompted the ODUSA (OR) to author a white paper concerning the identification of the problem and what could be done to resolve it. The conclusion of the paper was the following: there is no ACCS analysis direction given from DA to the analysis proponents/agencies; there is no prioritization of ACCS study requirements; and there is no regulation concerning analysis done in the ACCS area.

c. The general statement of the problem was developed from the situations/documents described in paragraphs 4-1 a and b above. It follows.

(1) ACCS analytical work has little overall direction and coordination throughout the Army. This is due to the lack of specific ACCS program guidance on which to base an analysis work program and a lack of communications within and among MACOMs.

(2) This problem is acute within the ACCS program because ACCS issues cross all functions of the Army.

d. The Command and Control Analysis Division of the Studies and Analysis Directorate, TRAC-FLVN, was tasked to perform the ACCS analysis integration project and, through coordination across the Army, developed a detailed problem statement. The specific problems include:

(1) The lack of a structured methodology by which DA guidance may dynamically affect ACCS analysis preplanning.

(2) The lack of centralized control in the management of ACCS analysis and in analysis preplanning.

(3) The lack of organization of ACCS analysis requirements from throughout the Army and the lack of a systematic merging of those analysis requirements with tool creation and data collection efforts. Specific problems include the absence of the following:

(a) Request for ACCS analysis requirements far enough in advance to allow preplanning.

(b) Scrutiny of requested analyses to eliminate duplications and voids (per DA guidance).

(c) Sequencing of proposed studies to facilitate the availability of necessary analysis results (from primary studies) necessary for follow-on studies.

(d) DA prioritization of proposed studies to ensure that the studies most crucial to the Army are addressed.

(e) Scheduling of studies to best use the resources of analysis agencies and contracting funds.

(f) Scheduling of both data collection (during tests and exercises) and tool creation to ensure their availability for the conduct of studies.

(g) Dissemination of ACCS analysis information to facilitate interaction between and among proponents and analysis agencies.

(h) Concise instructions for study proponents to expeditiously process study requirements.

4-2. Initial ACCSAI program developed.

a. Through a careful analysis of the problem statement, pertinent documents uncovered through the literature search, and early coordination across the MACOMs (particularly TRADOC, AMC, and ISC), an initial program was developed. The initial ACCSAI program was to serve as a strawman to present to future participants in the program. In this way, feedback was to be gathered to refine and restructure the program as appropriate.

b. The objectives of the initial ACCSAI program include:

(1) To integrate, prioritize, sequence, and schedule:

(a) ACCS studies.

(b) Tool development.

(c) Data gathering.

(2) To support decisions regarding:

(a) Army analysis resources.

(b) Contractor funding.

(3) To provide input to the AR 5-5 study program.

(4) To provide procedures for ACCS studies':

(a) Initiation.

(b) Conduct.

(c) Termination.

c. Figure 4-1 diagrams the initial ACCSAI program management structure. The initial annual cycle/flow of the program is shown in figure 4-2.

4-3. Coordination.

a. In order for the ACCSAI program to be viable, it was essential to coordinate with the future participants in the program. TDY trips were scheduled and meetings were held to coordinate the initial draft ACCSAI program with the following organizations.

(1) Department of the Army, Office of the Deputy Chief of Staff for Operations and Plans (DA ODCSOPS).

(2) Department of the Army, Office of the Assistant Chief of Staff for Information Management (DA OACSIM).

(3) Department of the Army, Office of the Deputy Chief of Staff for Research, Development, and Acquisition (DA ODCSRDA).

(4) Department of the Army Studies Program Management Office (SPMO).

(5) Headquarters Concepts Analysis Agency (HQ CAA).

(6) Headquarters Army Materiel Command (HQ AMC).

(7) Communications and Electronics Command (CECOM).

(8) Army Materiel and Systems Analysis Agency (AMSAA).

(9) Office of the Program Manager of Operations Tactical Data System (PM OPTDS).

(10) Office of the Program Manager for the Army Command and Control System (PM ACCS).

(11) Headquarters Information Systems Command (HQ ISC).

(12) Headquarters Training and Doctrine Command (HQ TRADOC).

(13) Combined Arms Training Activity (CATA).

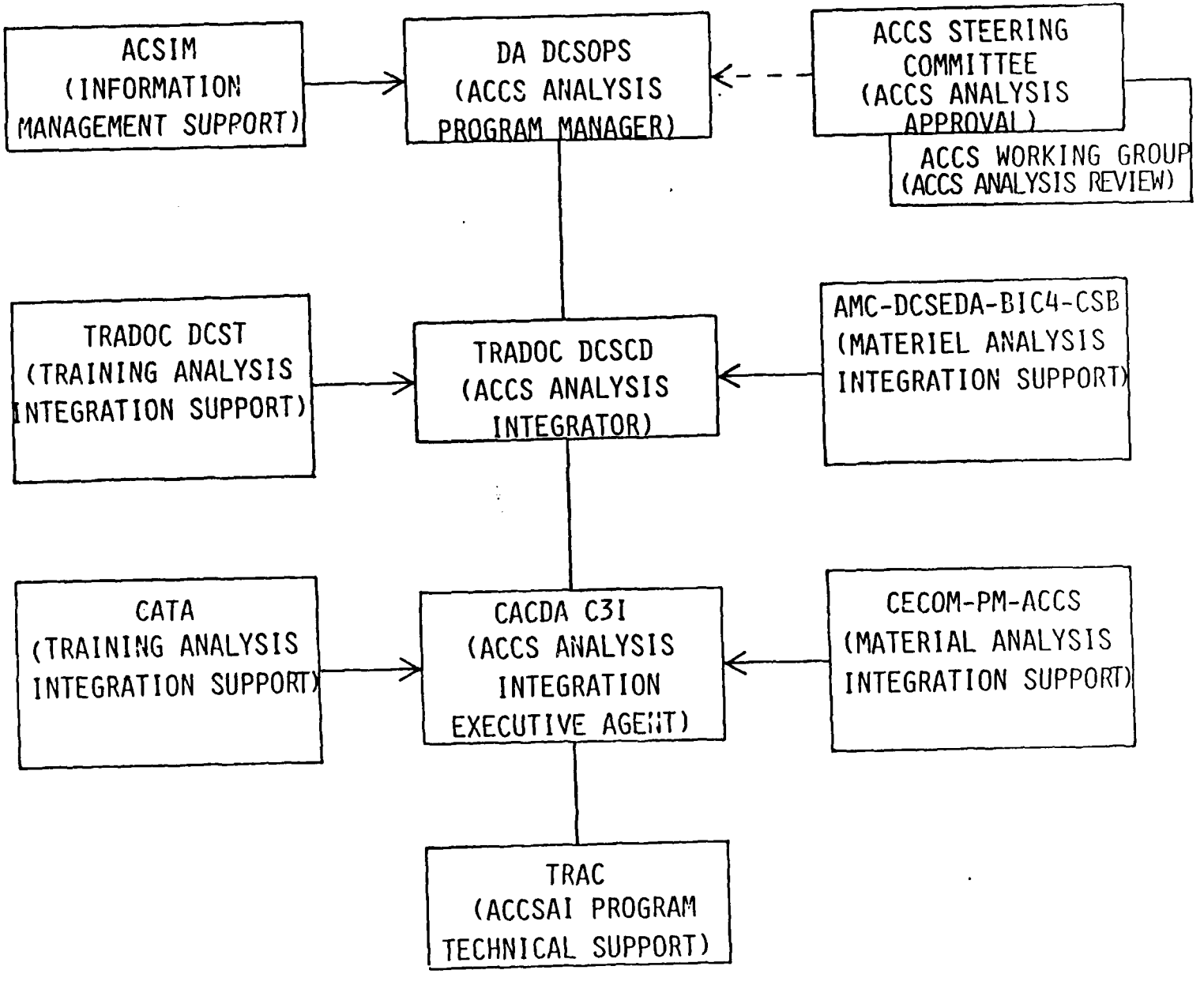


Figure 4-1. Initial ACCSAI program management structure

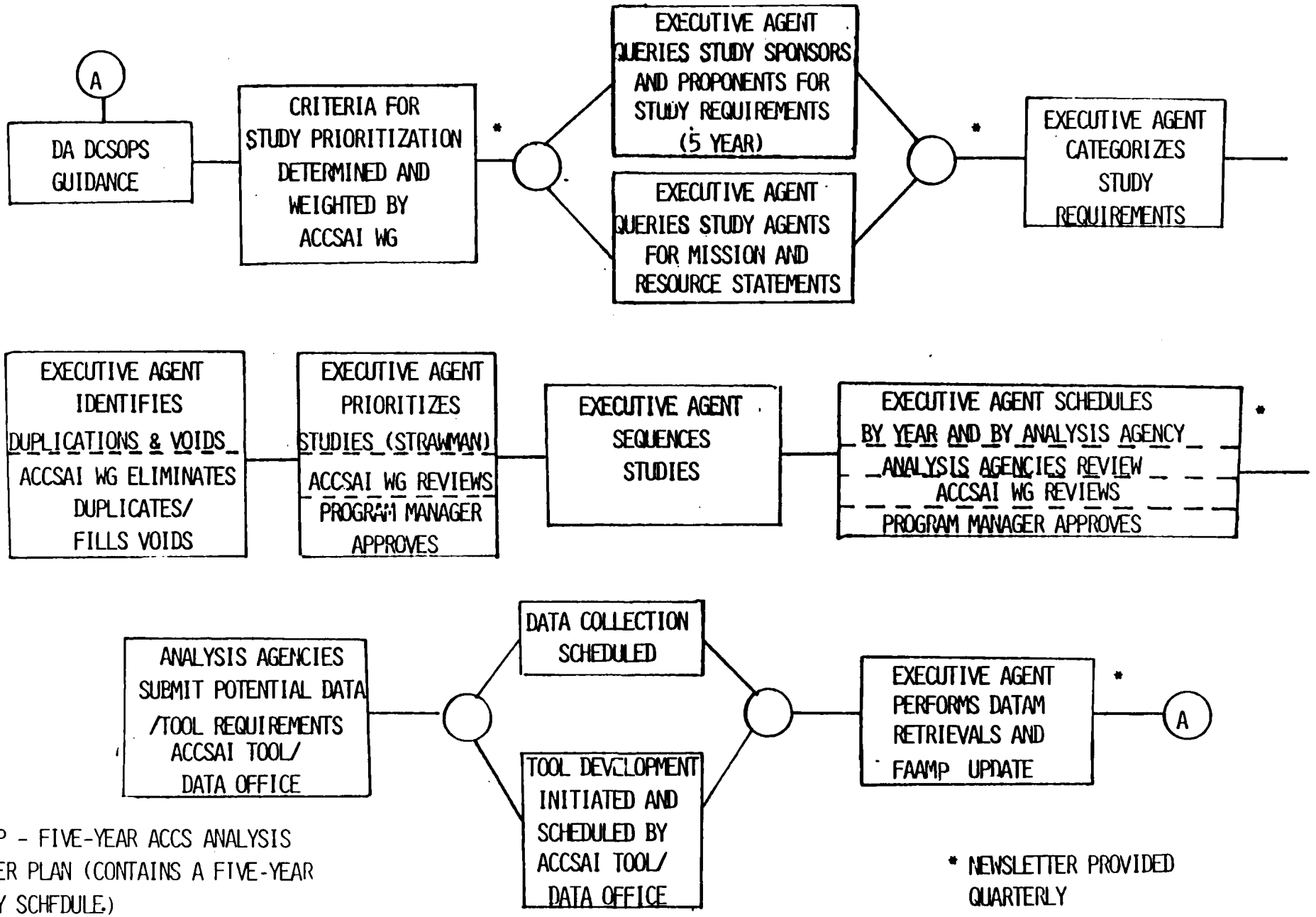


Figure 4-2. Initial ACCSAI program annual cycle

(14) Logistics Center (LOGC).

(15) TRADOC Combined Arms Test Activity (TCATA).

(16) US Army Intelligence Center/School (USAICS).

(17) Combined Arms Combat Development Activity, Command, Control, Communications and Intelligence Directorate (CACDA C3I).

(18) TRADOC Analysis Command Resource and Planning Division (TRAC-RPD).

(19) TRADOC Analysis Command Technical Operations Directorate (TRAC-TOD).

(20) TRADOC Analysis Command White Sands Missile Range (TRAC-WSMR).

(21) TRADOC Analysis Command Fort Leavenworth (TRAC-FLVN).

b. Comments were gathered concerning response to the draft ACCSAI program. These comments were separated into two categories: benefits and concerns. Comments are listed below.

(1) ACCSAI program benefits as seen by potential participants:

(a) Communication/interaction among the organizations involved in ACCS analysis (proponents, analysis agencies, materiel developers, testers, evaluators, managers, etc.) is a significant benefit of the ACCSAI program.

(b) A central repository (data base) for ACCS study results is essential.

(c) DA guidance concerning key issues would be very beneficial to the ACCS community.

(d) A tracking of projected and ongoing studies would be beneficial to the ACCS community and is essential for integration.

(2) ACCSAI program concerns as seen by potential partcipants:

(a) The initial ACCSAI program appears bureaucratic and time-consuming.

(b) The data base needs to be accessible Army-wide (and interoperable with other systems in existence).

(c) Centralized fiscal control is necessary to enforce the initial ACCSAI program but will be extremely difficult to gain. Without centralized fiscal control, proponents/analysis agencies will avoid the program. For the program to be successful, 100% participation is essential.

(d) The program cannot manage the large quantity of ACCS study requirements an Army-wide implementation plan will entail (especially as a result of including engineering-type studies). Sequencing becomes a problem.

(e) Placing a suspense on DCSOPS may be difficult, but if guidance is not provided in a timely manner, the program cycle will be thrown off.

(f) The program cannot handle the large number of short-suspense-type studies.

(g) A five-year cycle is very optimistic (due in large part to quick turnover of personnel).

(h) The ACCS SC/WG may not exist in the future and, if they do exist, will have little time to donate to the ACCSAI program.

(i) When the ACCS study requirements are submitted for integration with all other study requirements, there will be modifications in ACCS analysis sequences and schedules.

(j) Eliminating study redundancies may not be beneficial due to slightly different perspectives and goals; the need to have results validated through study redundancy; and the fact that the "not invented here" syndrome is alive and powerful.

(k) The program attempts to assume PM responsibilities and would stifle the PM processes.

c. As a result of the comments received, alternative methods of implementation became more sharply defined, as well as their respective benefits and concerns. Whereas, at the outset of the project, the level of implementation was to have been chosen at the end of the project, it became clear that the manner in which the program would be implemented would affect technical methodologies which are part of the program. Therefore, before finalizing the development of the program, a method for implementation had to be chosen. The medium by which this decision would be made was the midpoint SAG meeting for the project.

4-4. ACCSAI program alternatives developed.

a. There were three implementation alternatives presented to the SAG members for their decision:

(1) Alternative A (HQDA guidance, Army-wide implementation, centralized control, and centralized program execution).

(2) Alternative B (HQDA guidance, Army-wide implementation, Army-wide coordination, and decentralized control and program execution).

(3) Alternative C (HQDA guidance, TRADOC-wide implementation, TRADOC-wide coordination, TRADOC control, and TRADOC program execution).

b. What follows is a discussion of each alternatives' management structure, program cycle, and advantages and disadvantages.

(1) Alternative A.

(a) Under alternative A, the management structure would be as shown in figure 4-3. Alternative A is very similar to the initial draft program.

(b) The annual cycle is shown in figure 4-4. Annual guidance concerning ACCS analysis is provided by DA DCSOPS. This guidance is used by the ACCS WG to choose and weight criteria for the prioritization of all study requirements. The study requirements, which are projected out five years, are requested from all study proponents while mission/capabilities statements are requested from all analysis agencies. These documents are forwarded to the ACCSAI program executive agent (EA) residing in CACDA, C3I. All Army-wide ACCS study requirements are categorized, stored in an automated data base, and perused for similar and redundant efforts by the EA. Redundant efforts are then eliminated. All remaining study requirements are prioritized based on the prioritization criteria determined by the ACCS WG. A prioritized list of studies is drafted by the EA, manipulated as necessary and approved by the ACCS WG and, finally, approved by the program manager. Afterward, study sequences are identified and tagged by the EA. Sequences are determined by the input needed for the conduct of studies, products of studies, and topics of studies. The EA uses study priorities, study sequences, due dates, and analysis agency mission/resource statements to schedule the studies for conduct by year and by the appropriate analysis agency. (Studies which fall outside of the capabilities of Army analysis agencies are contracted.) An annual meeting is held for Army analysis agencies to discuss the allocation of studies and to resolve conflicts. The resulting schedule is reviewed and approved by the ACCS WG and the program manager of the ACCSAI program (DA ODCSOPS). This approved study schedule is distributed to all analysis agencies and proponents for perusal. When needs for data or an analysis tool are identified, the requirement specifications will be provided to the ACCSAI tool/data office for scheduling. (This must be done as soon as possible before a study is to be conducted. More lead time provides a better chance for obtaining the tool/data required.) All information on study requirements, ongoing studies within the program, and tool/data requirements is retained in an automated data base for easy manipulation and retrieval. Lists of studies by category, analysis agency, priority, and scheduled start date are disseminated annually through the Five-Year ACCS Analysis Master Schedule (FAAMS). A quarterly newsletter is provided to all participants in the program concerning the status of the program and news relating to the program.

(c) Major advantages to alternative A are as follows:

1. Centralized guidance, control, and execution of program will help ensure consistency throughout the ACCS analysis community.

2. Annual guidance provided by DCSOPS will guide ACCS analysis in the direction seen as most beneficial by DA by directly affecting the criteria by which studies will be prioritized.

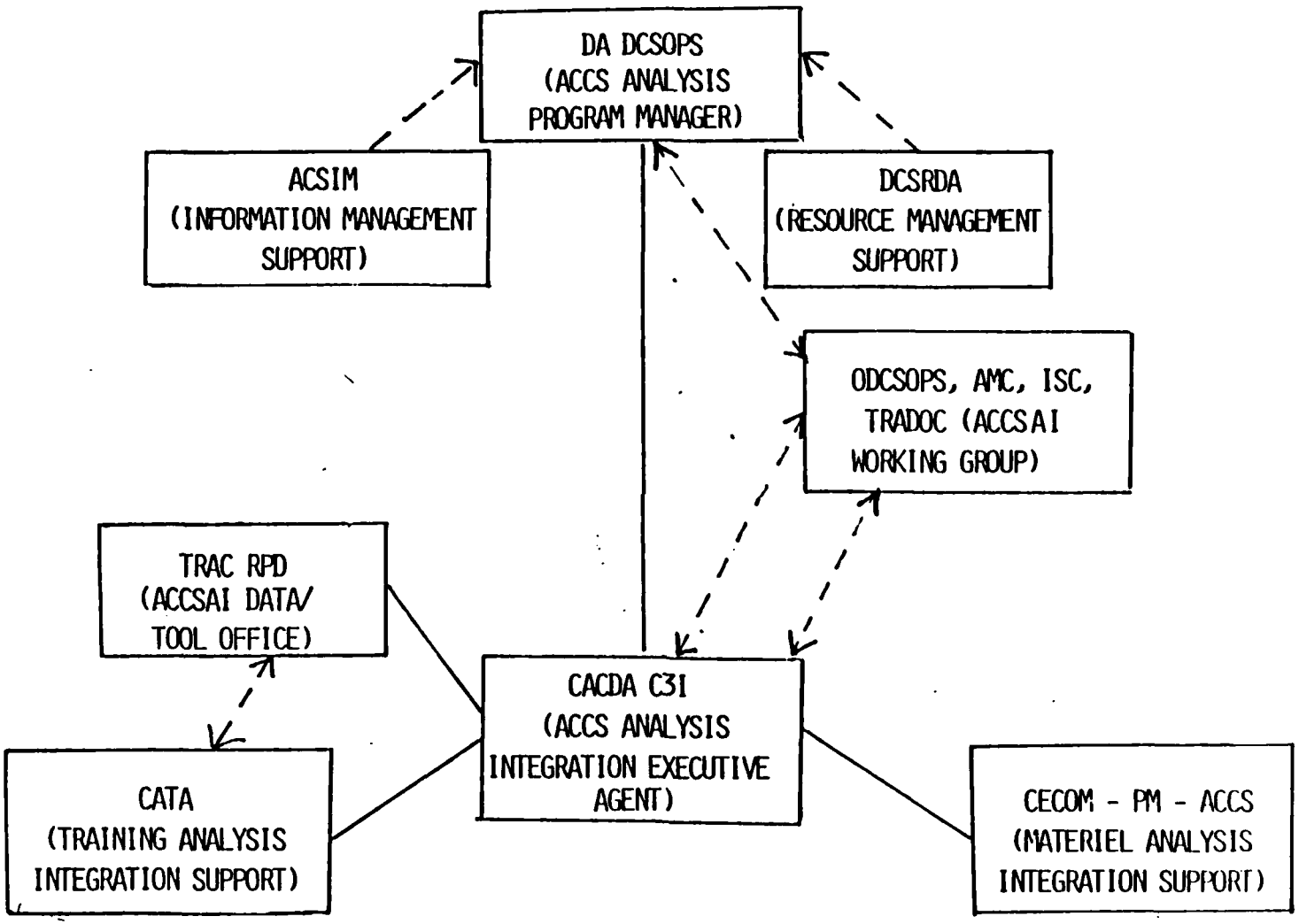


Figure 4-3. Alternative A program management structure

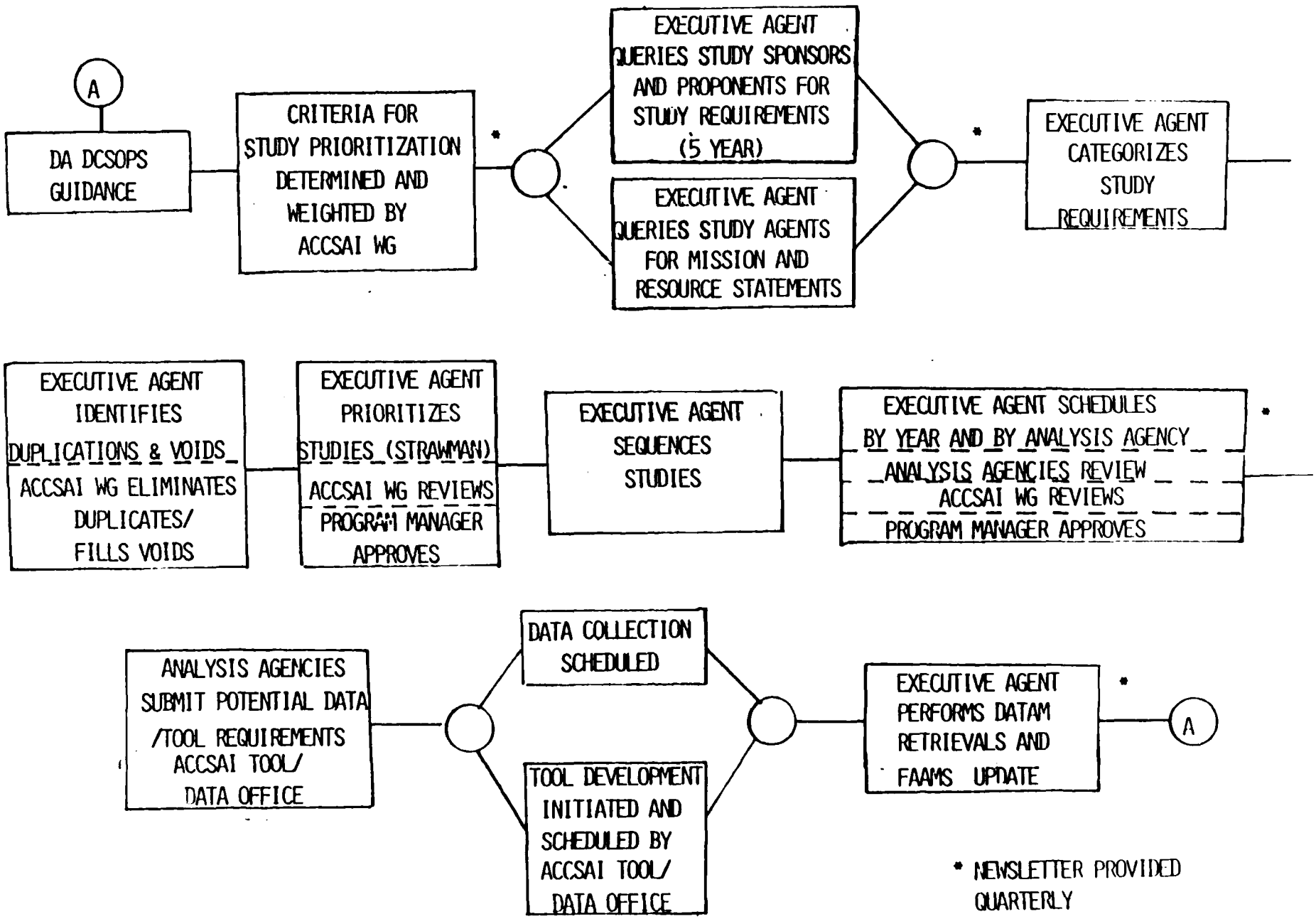


Figure 4-4. Alternative A annual cycle

3. A five-year projection will provide a structure for effective analysis preplanning.

4. A central clearinghouse for all ACCS study requirements will help ensure scarce analysis resources are used to the best advantage by:

a. Eliminating redundant efforts.

b. Sequencing studies so primary studies are completed in a timely manner to provide input to follow-on studies.

c. Ensuring that analysis agencies are programmed to conduct ACCS analyses which best suit their capabilities.

5. A meeting of analysis agencies will provide a forum for much needed communications throughout the analysis community.

6. A list of projected and ongoing studies and their POCs will encourage communication and, therefore, consistency throughout the analysis community.

(d) Major disadvantages of alternative A are as follows:

1. Because of the large number of studies associated with the Army-wide program, the man-in-the-loop portion of the program becomes overwhelming.

2. Alternative A appears to be bureaucratic and agencies seem hesitant to participate. If there are loopholes to allow nonparticipation, they will be taken advantage of. For the program to be successful, 100% participation is essential. Participation cannot be enforced without centralized funds.

3. It will be difficult (if feasible) to centralize fiscal resources for studies (both contract and in-house).

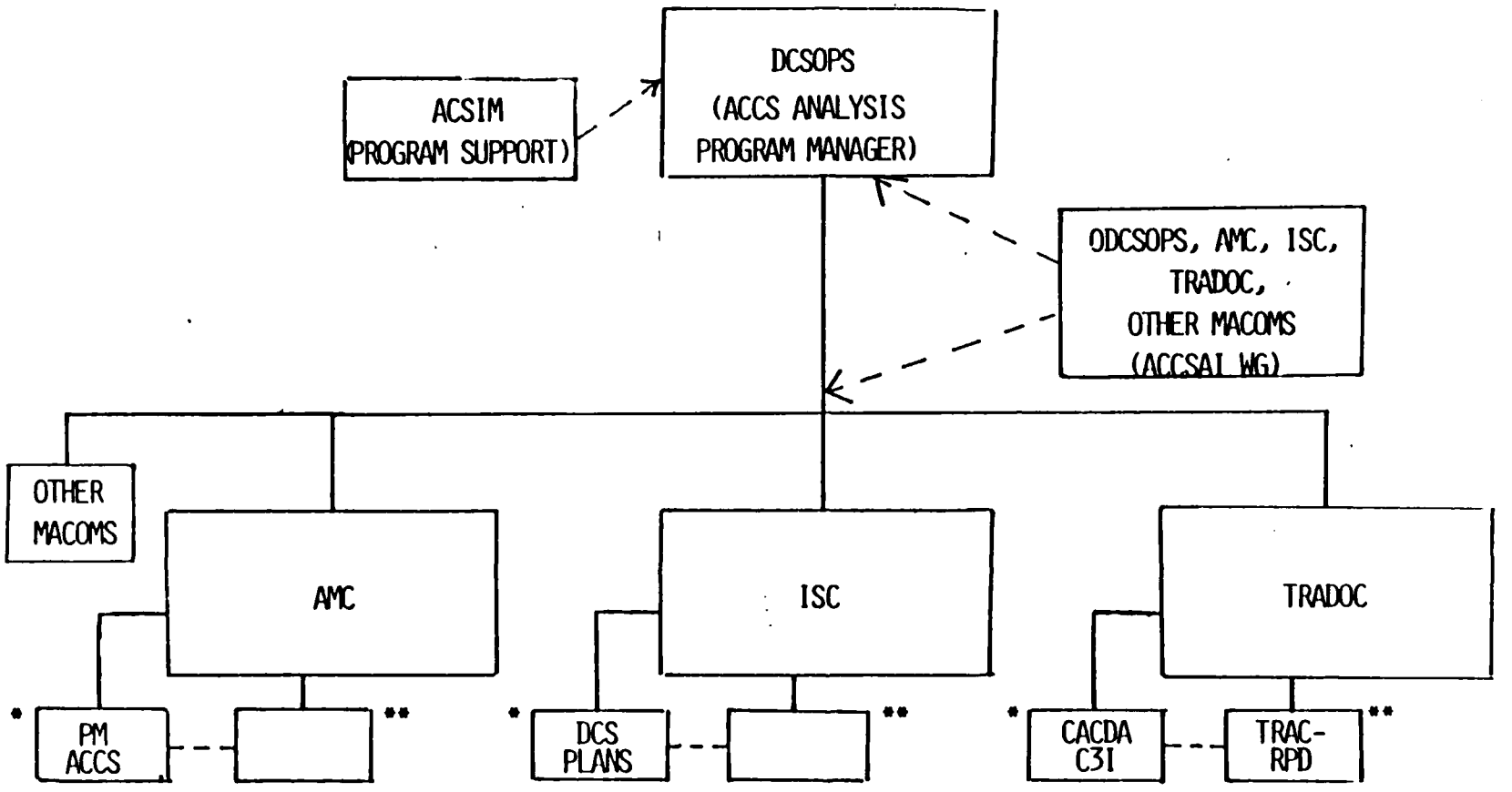
4. Alternative A can handle only a relatively small number of quick-response studies in an efficient manner.

5. A five-year cycle is unlikely to function.

6. The merging of all projected ACCS studies with all other projected studies may cause a major rescheduling within the projected ACCS studies.

(2) Alternative B.

(a) Under alternative B, the management structure is decentralized (and therefore simplified) to an ACCSAI program office and ACCSAI tool/data office located within each MACOM and an ACCSAI working group composed of representatives from each MACOM. The management structure for alternative B is shown in figure 4-5.



* RECOMMENDED AS OFFICE FOR MACOM ACCSAI PROGRAM OFFICE

** RECOMMENDED AS OFFICE FOR ACCSAI TOOL/DATA OFFICE

Figure 4-5. Alternative B program management structure

(b) The annual cycle for alternative B is shown in figure 4-6. DA DCSOPS provides annual guidance. The ACCSAI WG determines specific ACCS issues requiring analysis (based on DA guidance). It also ensures program conformance. Within each MACOM, the ACCSAI program office forecasts, categorizes, sequences, prioritizes, and schedules the studies. The ACCSAI program manager approves the program offices' results. All program offices send a computer disk of their categorized study requirements (to include priority and schedule) to the TRADOC program office. The TRADOC program office inputs the disks to a master data base which aggregates the information from the various MACOMs into one set of information. The resultant set of information is disseminated back to the individual MACOM program officers for reference. Then, ACCS proponents and analysts meet to discuss ACCS trends, forecast ACCS trends, discuss ACCS analysis problems, and current/projected areas of interest. At any time during this cycle when tool or data requirements are discovered, these requirements are provided to the MACOM's ACCSAI tool/data office. After the ACCS proponent and analyst meeting, the analyst will schedule data collection and will coordinate with the ACCSAI program office and ACCSAI tool/data office. Finally, when an ACCS study is completed, it is input to DTIC.

(c) Major advantages of alternative B are as follows:

1. DA guidance will provide a sound basis for consistent development of study requirements throughout the Army.

2. Centralized control exercised through the ACCSAI WG and the ODCSOPS ensures consistency throughout the ACCS analysis program.

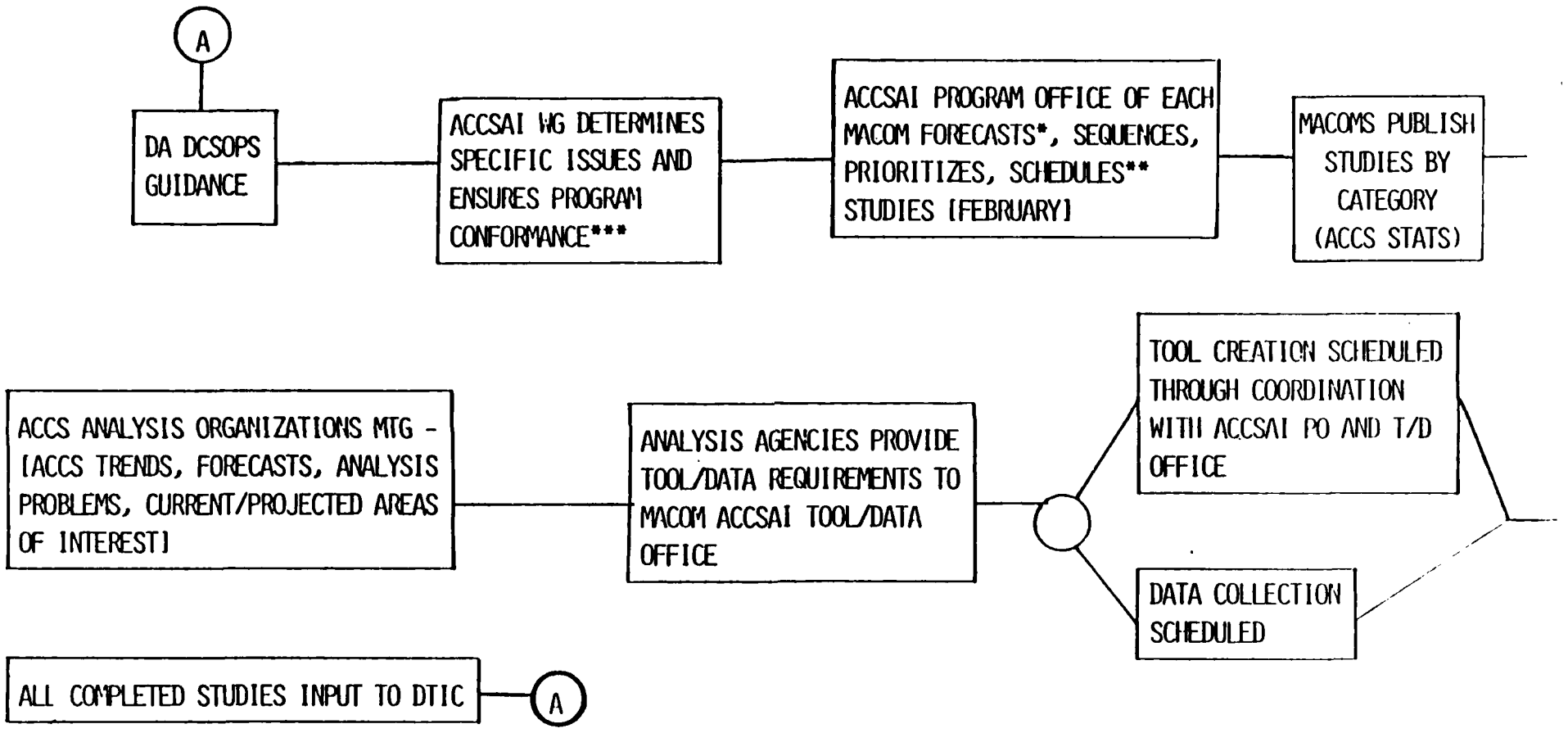
3. Annual analysis agency meetings will ensure communication throughout the ACCS analysis community.

4. The quarterly published newsletter will keep updated information supplied to all organizations. The newsletter effort presently exists at many organizations so it may require little additional effort. The newsletter will help eliminate redundant study/tool/data collection efforts and will encourage sequencing, when possible, on a more individual and managable level. The newsletter will be organized by category for easy location of specific type studies/tools/data. The newsletter will provide POCs and telephone numbers to encourage interaction between and among proponents and analysts.

5. Decentralized execution will encourage initiative and participation. Methodologies for study control may be used which best fit each MACOM's individual missions. Therefore, fiscal control is not needed to make the program functional.

6. MACOMs using the presently developed methodologies set forth in the ACCSAI project documentation will be capable of dealing with sequencing changes and quick-response studies more easily due to the decreased number of studies managed and fewer layers of management to filter through in order to process the changes.

7. This alternative will provide for a POC within each MACOM to encourage communication and management.



* USES THREE-YEAR STUDY PROJECTION
** AR 5-5 STUDIES SUBMITTED INDIVIDUALLY
*** MEETS THREE TIMES YEARLY

Figure 4-6. Alternative B annual cycle

8. A three-year projection for study requirements provides a realistic structure for ACCS analysis preplanning.

(d) Major disadvantages to alternative B are as follows.

1. Potential benefits from alternative A are greater than those for alternative B (assuming both could be implemented and were successful) due to the lessened amount of central management. Benefits lost by choosing alternative B over A will be control over contracting funds; Army-wide study sequencing/prioritizing/scheduling; and central control over the elimination of duplicate efforts. The exchange of a five-year projection for a three-year projection will create a possible, but not probable, loss of preplanning possibilities.

2. The success of alternative B is dependent upon the independent submission of information, at regular intervals, by the MACOMs.

3. Resources from each MACOM must be dedicated to the program (for newsletter publishing, data responsibilities, tool responsibilities, and enforcing submission of all study results to DTIC).

(3) Alternative C.

(a) The management structure for alternative C is shown in figure 4-7. Alternative C is scoped so that the program would manage only TRADOC studies.

(b) The annual cycle for alternative C is shown in figure 4-8. The alternative C cycle functions very similarly to the alternative B cycle except that the scope is TRADOC-wide rather than Army-wide.

(c) The major advantages of alternative C are as follows:

1. This alternative will provide a well-managed approach to ACCS analysis sequencing, prioritizing, scheduling, and data gathering for TRADOC-conducted ACCS studies.

2. The problem of lack of control and communication throughout the TRADOC ACCS analysis community will be alleviated.

(d) The major disadvantage of alternative C is: alternative C does not address the original Army-wide problem.

4-5. Alternative for implementation chosen.

a. Attendees of the midpoint meeting of the ACCSAI project SAG were briefed on the alternatives for ACCSAI program implementation. The result was the tentative approval of alternative B, modified to reflect:

(1) Maximization of the use of current study programs and management systems.

(2) Well-defined scope of studies to be included in the ACCSAI program.

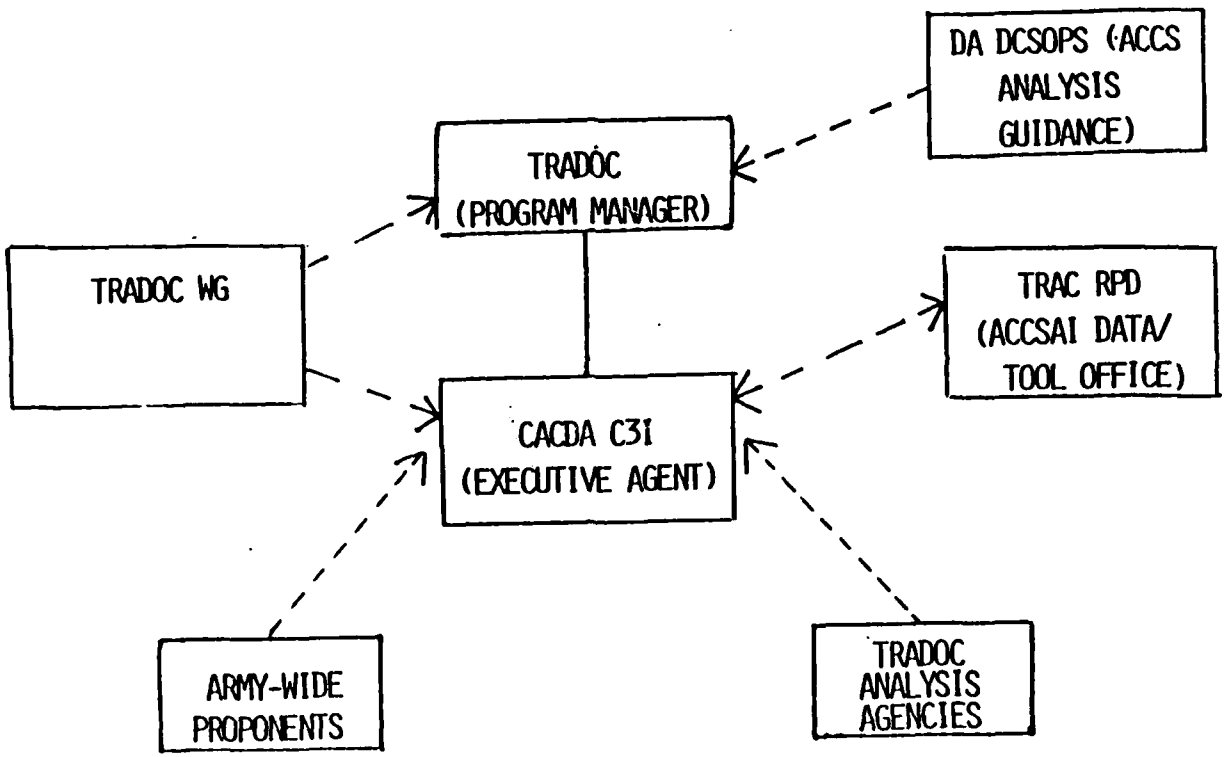


Figure 4-7. Alternative C program management structure

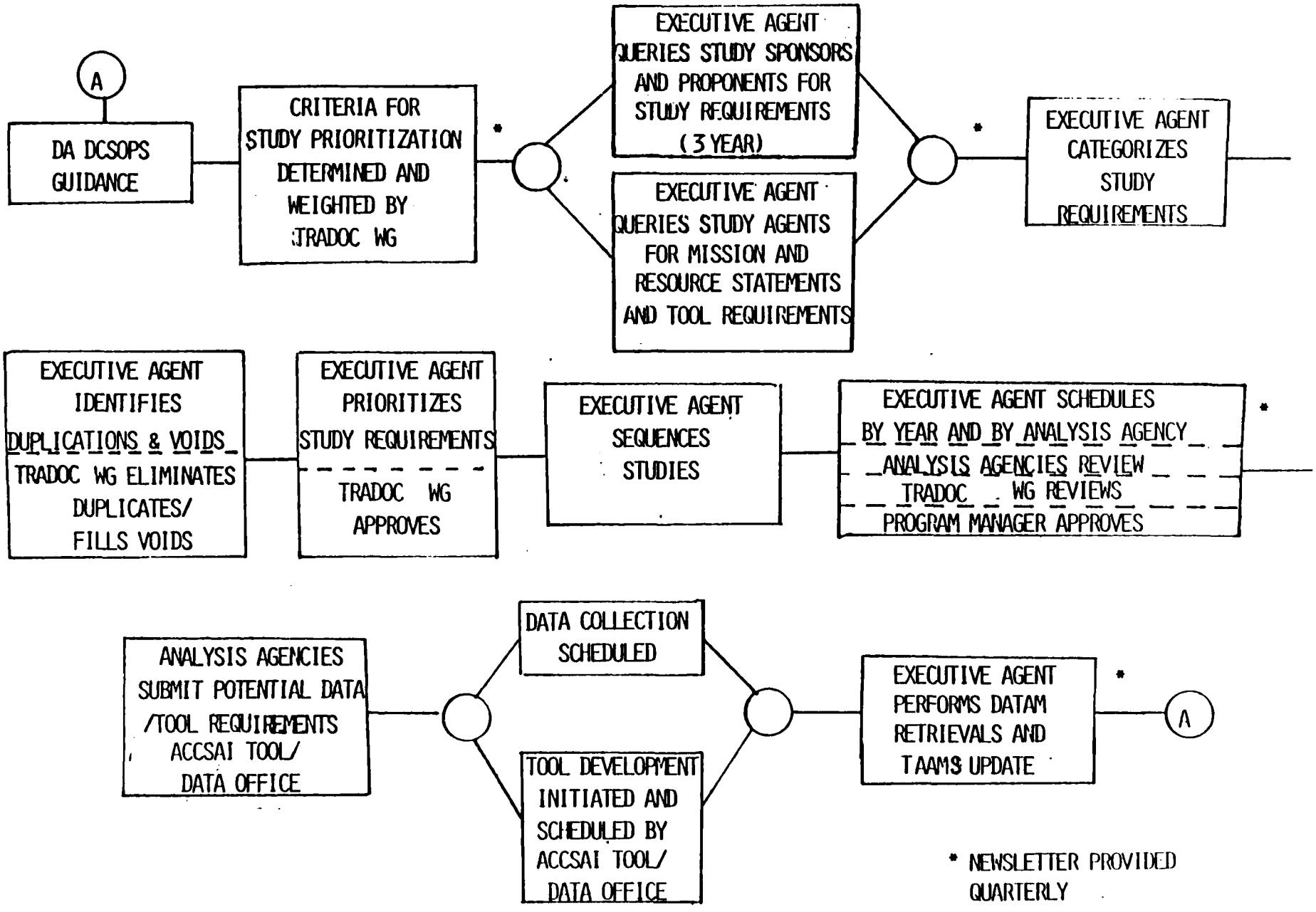


Figure 4-8. Alternative C annual cycle

(3) Enhancement of centralization of power to ensure identification and elimination of duplications and voids in study and tool development efforts without loss of individual MACOM control and without centralization of fiscal control.

b. Alternative B was chosen by the SAG over alternatives A and C because alternative B provided the means to solve the problems adddressed by the ACCSAI project. Alternative A is probably not feasible due to its requirement for centralized funds. Alternative C, because of its reduced scope, does not address the original problem.

c. After the SAG chose the implementation alternative, work began on the finalization of the technical methodologies, systems, and management structures to be used in the ACCSAI program. The documentation of the finalization of the methodologies is reflected in chapters 5 and 6.

CHAPTER 5

STUDY/TOOL MANAGEMENT METHODOLOGIES DEVELOPED

(STUDY CATEGORIZATION, CROSS-STUDY COMPARISON, STUDY SEQUENCING, STUDY PRIORITIZATION, STUDY SCHEDULING, TOOL/DATA MANAGEMENT)

5-1. Study Definition.

a. Upon the selection of an ACCSAI implementation alternative, to further define the ACCSAI program, a clear definition of the type of studies to be included in the program was required.

b. Due to an unclear notion across the Army concerning the definition of ACCS, the first requirement set by the SAG was to define the ACCS. A complete definition was written using the Army Command and Control Master Plan (AC2MP) and AR 11-39, the ACCS Program. The definition of a study was also required due to a general misunderstanding of exactly what type of efforts were studies. The references used to derive the definition of a study were the AR 5-5 and the TRADOC Primer. The studies to be included in the ACCSAI program could then be defined. This included a generic description of the type of studies to be included, a description of the two general types of studies as managed by the ACCSAI program (deliberate and quick-response), and specific examples of ACCSAI program study and nonstudy efforts. These definitions may be found in appendix L, chapter 2.

5-2. Study categorization methodology.

a. The purpose of the categorization process is to separate the analysis requests into small, cognitively manageable groups for identification of voids and duplications, similarities, sequences, and specific studies. Categories of studies may also be retrieved for use during literature searches. The categorization process is used to assist in the cross-study comparison and the sequencing process. Given a collection of ACCS studies, the categorization process channels those studies into subgroups. Utilizing categories shown in item 30 on the ACCSAI attachment to DD Form 1498 (figure 5-1), studies are sifted into ever-smaller groups. This process will be automated through the use of a computer and a data base management system (reference appendix K). The recommended categorization process utilizes the five dimensions referred to as "broad focus," "echelon," "mission area," "refined focus," and "key words."

b. The channeling process can be performed by the computer once the information on the AAD form has been entered into the computer. The relational data base management system, dBase III, was used (for further details on data base design and use, reference appendix K). dBase III permits retrievals to obtain the subgroups. Additionally, these subgroups may be written to a file for future manipulation in the sequencing and a cross-study comparison. Since these files are prepared for later manipulation, these files' contents are termed canned. The data base for the manipulation of the studies is the ACCS Study and Tool/data Schedule (ACCS STATS). Reference figure 5-2 for an illustration of the categorization process.

DRAFT

ACCSAI ATTACHMENT TO DD FORM 1498

26. How will the results of this study be used? _____

_____

_____

27. Does this study feed other studies (programmed or proposed)? If so, state study title, POC, and phone number.

Title _____ POC _____ AV _____
Title _____ POC _____ AV _____
Title _____ POC _____ AV _____

28. Decisionmaker for which study will be done: _____

29. Date decisionmaker needs decision: _____

30. Within each category below, check all items that apply.

Broad Focus: ____manpower and personnel ____operations and force structure
(AR 5-5) ____concepts and plans ____science, technology, systems and equipment

Echelon: ____sustaining base ____strategic ____tactical ____theatre/operational

Mission Area: ____C2 ____air defense ____close combat, light
(Must check ____comm ____aviation ____combat service support
at least one) ____IEW ____fire support ____close combat, heavy
____special operations forces ____combat support, NBC
____combat support, engineering & mine warfare ____combined arms

Refined Focus: ____utility ____requirements/specifications
____capability/effectiveness ____enhancement/solution
____vulnerability

Keywords: ____air interdiction ____command ____nuclear warfare
____automation ____control ____management
____biological warfare ____conventional forces ____rear area (deep)
____chemical warfare ____cost analysis ____rear area (friendly)
____close combat ____countermeasures ____survivability
____communications ____information ____support
____interoperability ____training

31. Item - level of system: _____

32. Network of systems: _____

33. C3I facility: _____

34. If making a change, state the reason for the change: _____

_____

Figure 5-1. The AAD form

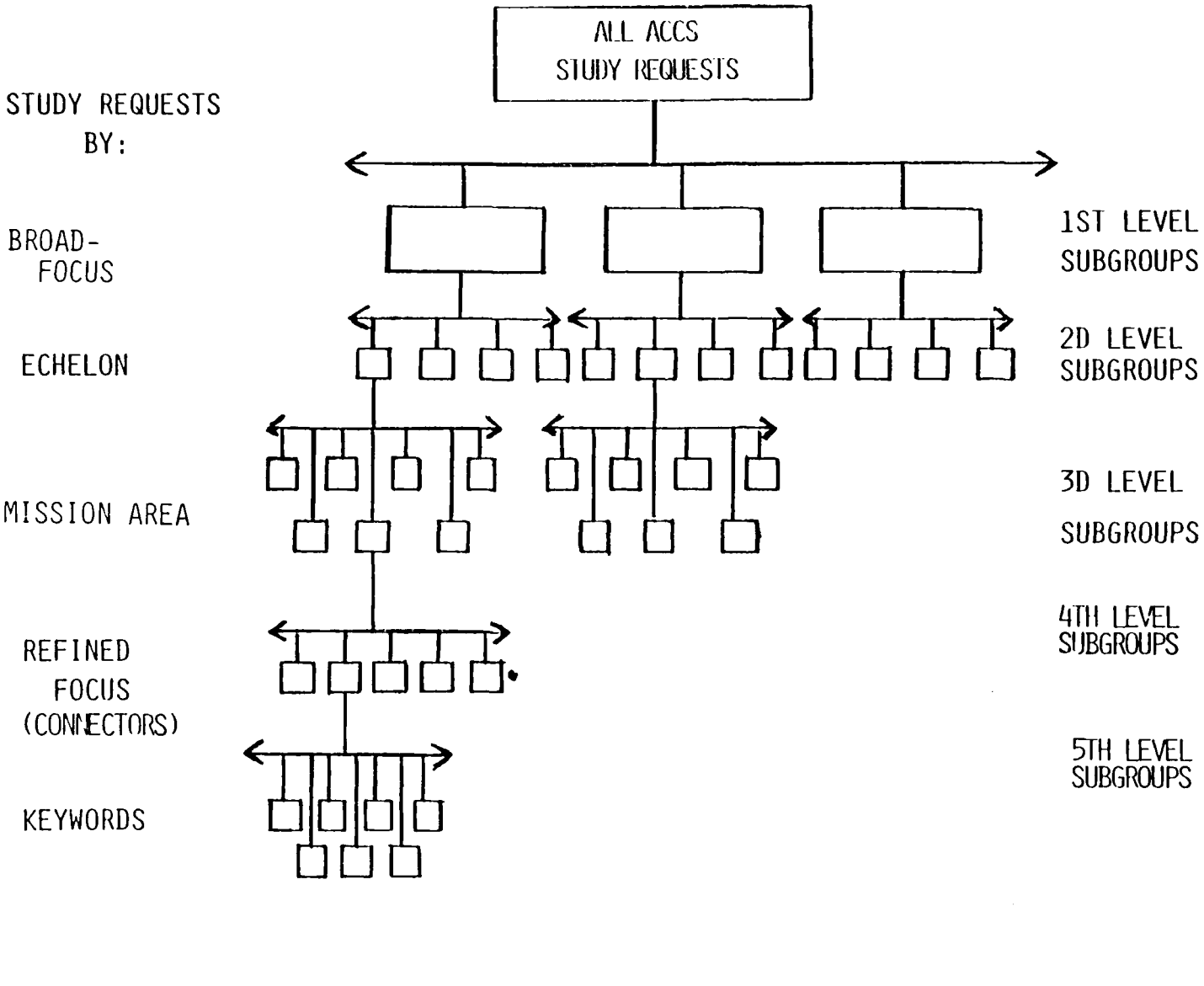


Figure 5-2. Categorization process

5-3. Cross-study comparison analysis methodology.

a. Through the cross-study comparison, voids, similarities, and duplications in study efforts will be identified. By using the categorization process and the automated data base, ACCS STATS, the program office will separate the large set of studies into small groupings of possibly three or four studies. In these small subsets, the program office can search for similarities and duplications. Once the similarities and duplications are found, they can be resolved. There are two ways in which duplicative efforts will be identified and eliminated.

(1) Individual MACOM program offices will search for and resolve problems within the MACOM concerning similar or duplicate studies.

(2) The executive agent for ACCS studies (CACDA C3I at Fort Leavenworth) will use a combined data base to search for problems across the MACOMs concerning very similar or duplicate studies. If the problem cannot be resolved at the executive agent level, the ACCS working group will be called on to resolve the problem.

b. The program office/executive agent can obtain study subgroupings in two ways, canned and interactively. The canned subgroups are those subgroups developed by retrieving subgroups of studies through the use of categories and then saving them to a file after the categorization process. The executive agent may want to bypass the first-level subgroups (due to the possibly large number of studies in those subgroups) and look at the second-level or third-level subgroups. Additional subgroups can be obtained by interactively accessing ACCS STATS. The program office/executive agent can conduct a search by using the descriptors found on the ACCSAI attachment to DD Form 1498 (AAD). (See figure 5-1. Descriptors are items 31, 32, and 33 on the AAD.) Again, the information may be written to a file for future use.

c. These subgroupings are merely aids to the program office/executive agent. The subgroups must be reviewed carefully, one at a time. Final determination will be made as to whether two studies are similar or duplicate by considering the study directive, DD Form 1498, and the AAD, and by consulting the appropriate proponents. Once a similarity or duplication has been identified, the study can be tagged so that action can be taken to merge or sequence similar studies and eliminate duplicate studies.

d. Similarly, the identification of voids can be assisted through the use of ACCS STATS in two ways, canned and interactively. If the EA performs a canned or interactive retrieval which yields an empty subgroup, he has discovered a possible analysis void. The program office/executive agent will review these subgroup voids to determine if a study should be programmed to eliminate the void.

e. The same method as described above can be used to determine similarities, voids, and redundancies in tool requirements. Additionally, this method will permit tool requirements to be matched against tools available. Tool management is discussed in paragraph 5-6.

5-4. Sequencing methodology.

a. Introduction. The sequencing portion of the ACCSAI program requires the identification of relationships among studies so that, when scheduling the conduct of studies, studies will be scheduled first which will have output (results) necessary as input for a follow-on study. Complicated networks may result. Therefore, software was developed to assist in sequencing (reference appendix I).

b. Selection criteria. The criteria for selecting the sequencing methodology are as follows.

(1) The methodology should systematically determine the interconnections between studies.

(2) The method should utilize the computer for time-consuming calculations.

c. Literature search. A literature search was conducted. Relevant results of this search were statements warning the scheduler to work within the overall Army's schedule (i.e., if data are needed for a study and the data input sheet is required in June, the project should be scheduled so that the data collection statement will be available in June). Most of the literature search yielded methodologies for independent studies (i.e., no prerequisite or corequisite studies). Our work, however, required the use of a methodology which considers dependent studies. Work sessions were held and a methodology developed. The recommended methodology fulfills the selection criteria.

d. Recommended method.

(1) Just as in the cross-study comparison (paragraph 5-3), the program office/executive agent will generate small subgroups within which to search for links between studies. The computer is used to sift the studies into subgroups. Using the lower-level subgroups resulting from the categorization process, further sifting can be performed using the descriptors found in items 31, 32, and 33 of the AAD form (figure 5-1). The descriptors are used to further analyze the subgroup for possible connectivity. The refined focus categorizers are used to suggest the actual sequence. For example, consider communications interoperability studies concerning a particular piece of equipment. A study establishing the utility of that piece of equipment should be conducted first. Then, assuming a need is established, the capabilities/combat effectiveness should be determined next in the sequence. Comparing friendly capabilities against threat capabilities, vulnerabilities are determined. Thus, a vulnerability study will be sequenced after the capabilities study. Studies to develop requirements and specifications are placed next in the sequence. Then, studies to recommend solutions should be placed in the sequence, and the solution development study completes the sequence. This process results in possible recommended sequences. The program office will determine the actual interconnectivity of the studies and, therefore, the sequence, using both canned and interactive methods. When the program office has finished, the result will be several networks of studies. This method satisfies the first selection criteria. The second selection criteria is satisfied by the computer program (see appendix I).

(2) The computer program is written to store study links determined through the above process. Each time the program office determines that there exists a need for sequencing studies X and Y (i.e., study X should be sequenced before study Y), that information will be entered. Before storage, the computer checks to ensure that this connection does not violate previous study links. If a violation occurs, the computer will present the problem for resolution. [Since the problem which would occur is cycling (X-> Y-> A-> X), a decision must be made between two courses of action. A previously established link may be broken (if the Y-> A link is broken, the resulting sequences are: X-> Y A-> X) or the last sequencing choice may be broken (if the A-> X link is broken, the resulting sequence is: X-> Y-> A). The small sequences presented by the computer keep the problem from being too overwhelming.] The acceptable links are then stored by the computer. After all subgroups have been considered, the computer extracts sequences using the previously established links and lists the detailed sequences. These sequences may then be written to a file for use in scheduling.

5-5. Study Prioritization Methodology.

a. Literature search. The DTIC search yielded the following prioritization methodologies: analytic hierarchy process (AHP), cost-benefit analysis, multiple attribute utility theory (MAUT), iterative decision method, and a modified eigenvector method. Prior to selecting a prioritization method, three criteria were determined for use in selecting the prioritizing method.

b. Selection criteria. The three criteria are:

(1) The method must use qualitative objectives (because that is the nature of study descriptors).

(2) The method had to ensure that major Army objectives were attained first.

(3) The method must be efficient (i.e., results must be available in a reasonable amount of time).

Keeping these criteria in mind, each method was reviewed for its applicability to the ACCSAI project. Consider, first, the analytic hierarchy process (AHP).

c. Analytic Hierarchy Process (AHP). AHP permits complex interrelationships to be considered. To prioritize using this method, a goal is set and nonoverlapping criteria which should be met to attain the goal are determined. (The criteria may be further subdivided into nonoverlapping subcriteria.) In effect, a hierarchy of criteria will be developed. These criteria are weighted. The studies are compared to each other and weighted. Then the two weights are aggregated to form a priority. The AHP was developed by Thomas Saaty (see reference 6). Permission was granted to use his material here.

(1) To find the criteria weights, the eigenvector method is used. (See figure 5-3 for a sample set of criteria and subcriteria.) The criteria are pairwise compared using Saaty's level of importance scale. (See table 5-1.)

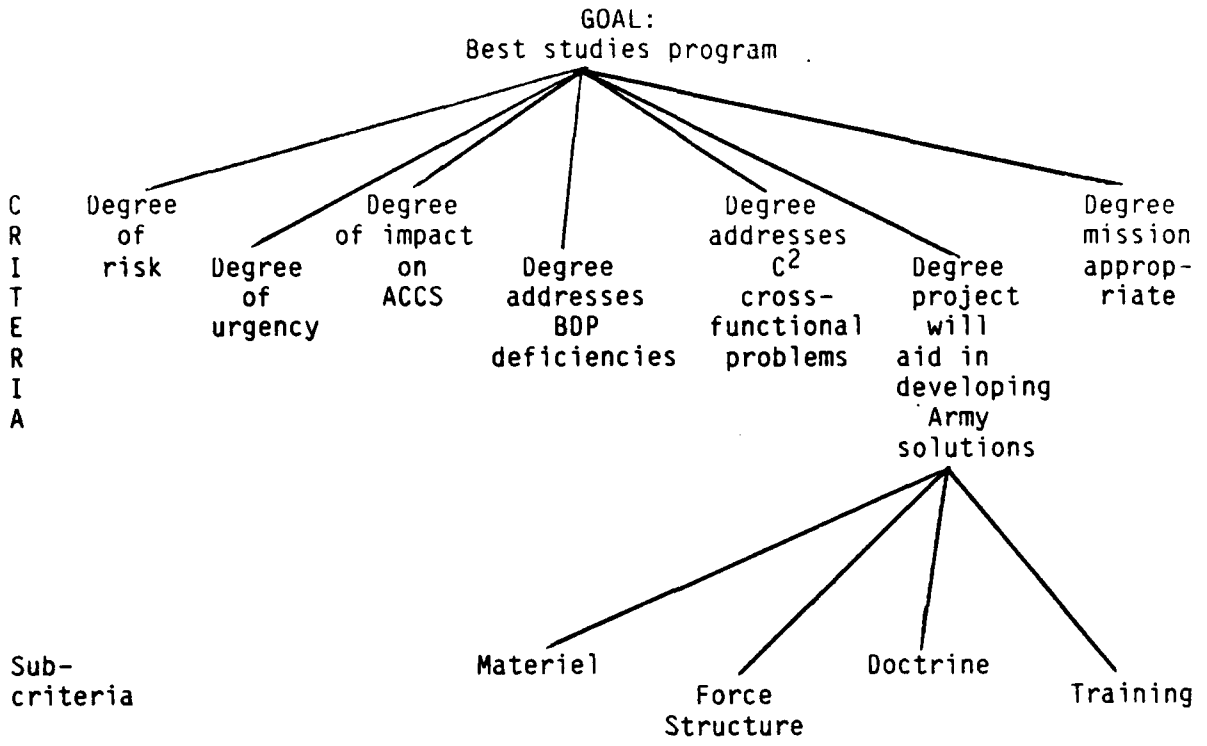


Figure 5-3. Sample set of criteria and subcriteria

Table 5-1. Saaty's scale

Level of Importance	Definition
1	equal importance
3	moderate importance
5	strong importance
7	very strong importance
9	extreme importance

(See reference 10)

(2) To see how Saaty's scale is utilized in the matrix, consider the goal's criteria and subcriteria listed in figure 5-3. Table 5-2 shows a matrix of results of a pair-wise comparison. (Numbers shown are for illustration purposes only.) The slot indicated by a given row I and column J shows the relative importance of the criteria I over the study J. For illustration, the 3 in row A and column B indicates risk is moderately more important than urgency. A number in parentheses indicates an inverse, i.e., (4.0) in row B and column C represents 1/4. This indicates that it is C, the impact, which is somewhere between moderately more important and strongly more important than B, the urgency. In effect, we are determining relative weights. Relative to impact, urgency should have 1/4 the weight. This is the same as saying relative to urgency, impact should have 4 times the weight.

(3) Only the upper half of the matrix is filled because the lower half yields redundant information. For example, the diagonal elements would all be 1 since one is comparing a study against itself. The lower diagonal elements are the inverse of upper diagonal elements because the same question is being asked "backward."

Table 5-2. Judgments with respect to goal

		A	B	C	D	E	F	G
A:	RISK		3.0	1.5	2.0	2.0	2.0	3.0
B:	URGENCY			(4.0)	1.0	(2.0)	1.5	1.0
C:	IMPACT				4.0	2.0	3.0	3.0
D:	AID SOLU					(1.5)	(1.5)	1.5
E:	BDP DEF						2.0	2.0
F:	C2 FUNCT							2.0
G:	MISS APPR							

1 EQUAL 3 MODERATE 5 STRONG 7 VERY STRONG 9 EXTREME

(4) This matrix yields the weights which will be attached to the major branches of the tree shown in figure 5-3. (Another pair-wise comparison would yield weights for the subcriteria. A separate matrix is required for each set of subcriteria.) The principal eigenvector, which exists and is unique, contains the weights given to the branches of the tree. (The mathematics behind obtaining the principal eigenvector as well as information concerning its existence and uniqueness are found in appendix G. Software is available which will determine this principal eigenvector. The project team used Expert Choice.)

(5) Next, the studies to be prioritized are compared to each other in the same way that the criteria were compared to each other. The difference is that there is a comparison matrix of studies for each criteria (or subcriteria as in the case of the subcriteria to "degree project will aid in developing Army solutions."). Thus, there would be a matrix of comparisons where each study was compared to the other studies in terms of the degree of risk, another matrix would be filled out comparing each study to all other studies in terms of the degree of urgency, and so on. For each of these matrices, the principal eigenvector is found. By pooling the principal eigenvectors found, a weight is assigned to each study. (See figure 5-4 for an example.) The study with the highest weight would be ranked number 1, the second highest weighted study would be ranked number 2, and so on.

```
.357
.279     is the principal eigenvector for the criteria matrix.
.089              (subcriteria are not considered here)
.279


.25
.30     the principal eigenvector for each study matrix.
.35
.10

Study 1 ---> .357(.25)+.357(.25)+.357(.25)+.357(.25)=.357
Study 2 ---> .279(.3)+.279(.3)+.279(.3)+.279(.3)=.3348
Study 3 ---> .089(.35)(4)=.1246
Study 4 ---> .279(.10)(4)=.1116

Study 1 is ranked 1.
Study 2 is ranked 2.
Study 3 is ranked 3.
Study 4 is ranked 4.
```

Figure 5-4. Final weight for AHP

(6) With respect to the selection criteria, the AHP utilizes the qualitative objectives thereby satisfying the first criteria. This method has a systematic approach as is evidenced by the scales used and by listing the objectives hierarchically. By defining the scales, some of the variance of human preference is lowered. (One person's scale value of 3 is more comparable to another person's scale value of 3 because 3 has been qualified to mean "moderately more important.") By establishing a hierarchy of objectives, one obtains nearly mutually exclusive (nonoverlapping) criteria which, when judged, will yield reasonable results. (Overlapping criteria would lead to unintended multiple weighting, i.e., some objective would be rated twice because it was not distinctly separated from the other objectives. The hierarchy form makes it easier to separate the objectives.) This weighting of the objectives satisfies the studies selection criteria as well, for studies which satisfy the heavily weighted criteria are ranked

higher than those studies which do not. Thus, if the chosen criteria reflect important army goals, studies assisting in the achievement of that goal will be performed first. Unfortunately, the AHP, as it stands, is not as economical with respect to time as necessary. The last step which meshes the weighted branches of the tree with the list of studies would prove very time consuming. For two criteria and a set of 100 studies, one would be required to fill out the upper half of two 100 x 100 matrices. For this reason, the AHP is not recommended.

d. Cost-benefit analysis.

(1) An alternative methodology considered was the cost-benefit analysis methodology. Cost-benefit analysis considers the ratio of benefits to costs. The benefits are subjectively determined and the cost projected. The benefits that are associated with a program are scaled such that a program with a benefit value of 100 is twice as beneficial as a program with a benefit value of 50. (Thus, the benefit value is an aggregate value for all benefits, not merely an individual benefit value.) The project with the highest ratio of benefits to cost is ranked 1; the project with the second highest ratio of benefit to cost is ranked 2; etc. (See table 5-3.)

Table 5-3. Cost-benefit table

PROJECT	BENEFIT	COST IN MILLIONS	BENEFIT COST	RANK
A	100	$20	5	2
B	33	$11	3	3
C	10	$ 1	10	1

(2) The cost-benefit analysis requires a quantifiable constraint: cost. Since projected costs play a major role in determining the final rankings, poor cost estimates would arbitrarily skew the rankings. Thus, great care must be used in estimating the costs.

(3) Considering the three selection criteria, the cost-benefit analysis does utilize the qualitative objectives available. (The qualitative objectives would be benefits.) Thus, the first selection criteria is satisfied. As for the second selection criteria, the cost-benefit analysis (inadvertently) permits weighting for the objectives. (Recall a project with a benefit rating of 50 is twice as beneficial as a project with a benefit rating of 25.) Concerning the third selection criteria, this method is not very time-economical because, in order to obtain reasonable cost estimates, it would be necessary to spend a great deal of time. Since the cost-benefit analysis does not adequately meet the selection criteria, it is not recommended.

e. The iterative decision method (IDM).

(1) Another method researched was the iterative decision method. This method has many variations, but the common theme is best exemplified by what has been termed the blue card method. The experts are each given a stack of cards. Each card lists a program and each stack contains all the programs to be prioritized. The experts independently rank the programs by placing the cards in order of the program's priority. Then, statistical analysis is performed to determine the variations in judgments. An aggregate ranking is determined and the experts convene to discuss those programs for which there was great disagreement in terms of ranking. The results of the expert meeting would be the final ranking of the programs.

(2) Concerning the selection criteria, the IDM is found to be lacking. The IDM utilizes qualitative objectives; therefore, the first criterion is met. The second selection criterion is not met, however. No actual weighting is done. Individuals may intuitively weight objectives, but the results are that differing objectives with differing weights are consolidated in an aggregated report. Thus, the "weight" which results is extremely haphazard. As for the third selection criterion, it appears the method would be economical with respect to time. However, since the IDM did not adequately satisfy the second selection criteria, it is not recommended.

f. Multiple attribute utility theory (MAUT).

(1) Next, consider the multiple attribute utility theory, MAUT. For this method, attributes must be determined that are common characteristics of all the available alternatives. (In our case, the alternatives are the studies to be prioritized.) These attributes have another requirement; they must influence the selection of a particular alternative. The attributes are then ranked, rated, and normalized to determine the weights which should be assigned to each attribute. Each of the projects are then scored with respect to each attribute. (The scoring may be scaling the projects from 0 to 100.) The utility function is the sum of the weighted attribute scores.

(2) Thus, if the weights of each of the i attributes are given by $w(i)$ and if there are two studies, study X which rated $x(i)$ on each ith attribute and study Y which rated $y(i)$ on each ith attribute, then the utility function of X would be $U(x) = \quad w(i)*x(i)$ and the utility function for y would be $U(y) = \quad w(i)*y(i)$. When cost is not a consideration, the project with the highest utility function value would be ranked first, the project with the second highest utility function would be ranked second, and so on. If cost were a consideration, one could consider utility to cost ratios. This utility-to-cost ratio parallels the benefit-to-cost ratio and is ranked in the same manner. (That project with the highest ratio of utility-to-cost would be ranked first, etc.)

(3) Considering the criteria for selection, MAUT does utilize the qualitative objectives available. (The qualitative objectives would be the attributes.) Weights are used, thus, the second selection criteria is satisfied. In determining the weighting of the attributes, however, one must make many comparisons at one time. In comparing 10 attributes, 9! computations are made. Thus, just as in AHP, this method could prove very time consuming. The MAUT is not recommended since it does not adequately meet the selection criteria.

g. The modified eigenvector method.

(1) Criteria weighting. The modified eigenvector method develops and weights criteria just as AHP does (see paragraph 5-5c). The difference between the two methods lies in the prioritization of the studies after the criteria have been weighted. In the modified eigenvector method, after the weighting of the criteria, multiple attribute utility theory is used to obtain a contribution score.

(2) Contribution score. By using a spread sheet format, a number is assigned to indicate the relative contribution of a study to each criterion by using the scale shown in table 5-4. Table 5-5 shows a completed spread sheet. (The numbers shown in the spread sheet are for example only. To obtain the final contribution score for each study, the scores received under each criterion are multiplied by the weight of that criterion. Then, these products are summed across the spread sheet. For the systems C^2 Eff. Study, the contribution score is: .357 (6) + .279 (5) + .084 (7) + .279 (5)=5.520.

Table 5-4. Contribution scale

Value	Definition
0	No contribution
1	Very weak contribution
2	Weak contribution
3	Moderately weak contribution
4	Moderately strong contribution
5	Strong contribution
6	Very strong contribution
7	Extreme contribution

Table 5-5. Spread sheet

	CRITERIA					
Study	Risk (Wt) .357	Criticality (Wt) .279	Urgency (Wt) .084)	Impact (Wt) .279	Contrib. Score	Project Priority
C^2 Eff Study	6	5	7	5	5.520	1
CP^2	3	6	6	6	4.923	3
HQ	7	4	4	4	5.067	2

(3) Priority. The study priorities are then based on these contribution scores (see table 5-5). The study with the highest contribution score is initially ranked 1; the study with the second highest contribution score is initially ranked 2; etc. These priorities would be generated by the program office. The recommendations would be reviewed and the study priorities manipulated as needed by the study proponents and MACOM management.

(4) Computer programs. Computer programs are available to find the principal eigenvector. A few additions would permit the modified eigenvector method to be automated, thereby making the process very responsive.

(5) Buffering. Since the contribution score of a study is determined by each year's prioritization criteria, the potential exists for drastic changes in priorities when changes in criteria occur. To prevent this seesaw effect, the contribution score may be buffered. The final contribution score will be 50% of this year's contribution score and 50% of last year's contribution score. Thus, for example, if a given study had a contribution score of 5 using the first year's criteria and 4 using the second year's criteria, the final contribution score for year 2 would be 4.5. To see the effect of buffering, consider table 5-6.

Table 5-6. Table entries

Table entries = weight of X year's criteria on final score.
Y:years in advance of study conduct
X:years in advance of study conduct

X / Y	+3	+2	+1	+0
3	.125	.125	.25	.5
2		.25	.25	.5
1			.5	.5
0				1.0

This figure shows that a study entered Y years in advance will receive a specific contribution from each X year's criteria. For example, a study

entered 2 years in advance would have a final contribution score based on 25% of the +2 year's criteria, 25% of the +1 year's criteria and 50% of the +0 year's criteria. (This is the same as saying 50% of last year's final contribution score plus 50% of this year's contribution score.)

h. Conclusion. Based on the discussion in paragraphs 5-5b through 5-5g, the modified eigenvector method is the preferred choice. This conclusion is based on the fact that the modified eigenvector method:

(1) Utilizes qualitative objectives as evidenced by the criteria and use of Saaty's scale and the contribution scale.

(2) Will be economical, with respect to time, as much of it can be computerized providing fast turnaround.

(3) Ensures major Army objectives are attained through its weighting method which skews the priority of those studies most useful in attaining the Army's objectives to the top.

5-6. Study scheduling.

a. Introduction. Since every study has output and many studies will have prerequisites, the program office must schedule the studies so that the sequencing is not violated. Previously established study priorities also must be retained within the study schedule.

b. Methods researched. The scheduling methods found within the literature search were not applicable since they did not consider sequencing.

c. Recommended method.

(1) The scheduling process utilizes the computer to perform the time-consuming manipulations and employs the ACCSAI program office (PO) to resolve conflicts. The PO will make a preliminary determination of which agency should perform each study based on information gathered from the input forms, e.g., analysis agency mission, study category, resource statements, and previously made resource determinations. The computer permits the studies to be tagged by analysis agency through the use of a database management system. These assignments will be validated by the study agencies. (Reference appendix J for further information on the scheduling program.)

(2) The method of scheduling chosen calls for the sequence of studies with the greatest average contribution to be scheduled first. (The contribution score of each study is obtained through the prioritization process. To obtain the average contribution score of a sequence of studies, sum the contributions of the individual studies in the sequence, then divide the sum by the number of individual studies. There will be sequences consisting of a single study. Such sequences' "average" contribution is equal to the contribution of the single study.) The computer can schedule a study using its sequence constraints, its time constraints, and its analysis agency's manpower constraints.

(3) The program office would be called upon for a decision when a problem develops (i.e., all the constraints cannot be satisfied). For example, the sequence of studies with the highest contribution may have been scheduled with no constraint violation. The next study must be sequenced before the end of the next FY. However, the resources needed for the study are not available before the following FY. The decision must be made concerning how to shift resources. (Should a study be programmed out of sequence or conducted by an alternate analysis agency or contractor?) The above described process will result in a draft schedule.

(4) MACOM management, proponent representatives, and the program office meet to review the draft schedule of studies. Changes will be made as necessary.

5-7. Tool/data management.

a. General. Timely tool development and data gathering is crucial to an effective studies program. The present lack of timely tool (model, data base) development and data gathering for use in studies was one of the problems to be addressed by the ACCSAI project.

b. Development of tool/data management methodology.

(1) In the initial ACCSAI program developed early on in the ACCSAI project, necessary tools/data for the conduct of a study were to be identified by the study proponent and submitted on the study input form. However, as this approach was coordinated with future participants in the ACCSAI program, it became obvious that it was an unacceptable method because, quite often, a substantial amount of front-end analysis must be done to identify the precise nature of the study to be undertaken and then to identify the necessary tools/data required. Proponents generally do not have the resources to conduct such front-end analyses.

(2) Though the initial method for approaching tool/data management was deficient, the early identification of the tool/data requirement had to be retained. Because the study requirements were to be identified as soon as possible to facilitate appropriate sequencing, scheduling, and prioritizing, it was decided that the analysis agencies, as soon as they are identified to conduct a study, should make a determination as to what the tool/data requirements are. This would require some preliminary front-end analysis (which analysis agencies would be required to do in any method). Thus, it was determined that this was the appropriate place for the tool/data identification to occur. As identification of tool/data requirements occurs, the requirements would be coordinated with the MACOM ACCSAI tool/data office who would assist the analysis agency in finding existing relevant tools/data, or would help schedule the development of new tools or gathering of new data.

(3) As the ACCSAI program developed and the implementation alternative was chosen, each MACOM became responsible for the management of their own studies and tools/data. Because of the large quantity of information to manage and to keep within mission and functions statements for existing organizations, the responsibilities for study management and tool/data management were allocated to two different offices within each MACOM. (Identification of the two offices is to be determined by the MACOM.) Just as an executive agent (TRADOC) was assigned for inter-MACOM coordination and integration for studies, an executive agent (AMC) was assigned for inter-MACOM coordination and integration for tools/data. (Further information on the roles of the executive agents is provided in chapter 6.) The ACCSAI tool/data executive agent would be responsible for eliminating duplicate tool/data collection efforts across the MACOMs as well as providing a central repository for the collection and consolidation of tool/data information from all MACOMs, and then disseminating the consolidated information back out to all other MACOMs.

CHAPTER 6

INFORMATION MANAGEMENT

6-1. General. As the project developed, it became obvious that an ACCSAI program would have to effectively manage large amounts of information. The management of information fell into three categories: gathering information, manipulating information, and disseminating information. The chapter is divided into three sections corresponding with the three categories of information management.

a. Gathering information. To manage a studies program by sequencing, prioritizing, and scheduling studies, tool development, and data gathering, detailed information must be gathered on the study requirements, capabilities of the analysis agencies, and tool/data specifications. Input forms were developed for each of these purposes. This section on gathering information is divided into three sections corresponding to study information, tool/data information, and analysis agency information.

(1) Study information. Forms would be required for a proponent to initiate a study, update the status of a study, and to terminate a study.

(a) Study initiation forms. The study initiation form went through many iterations prior to its finalization. The information on the input form is required to categorize the study so that it would be grouped with like studies. This would facilitate the manipulation of the studies later on. The determination of the categories to be used was the most difficult problem associated with this portion of the ACCSAI project. The first design that the input form had was that of a matrix which would gather information not only on future analyses, but also on ongoing analyses, past tool development or data gathering, and tools still required. Through trial runs, it was determined that the matrix form was extremely difficult to use even with lengthy directions and definitions. It was also determined that tool/data information and information on ongoing or completed studies should not be gathered on the same form. The next form developed gathers information in questionnaire form on study requirements only. (A separate form, discussed later, gathers information on tools/data.) The questionnaire format proved much easier to use than the matrix form and was widely accepted by the future participants in the ACCSAI program. However, concern was raised by the SAG that forms are proliferating throughout the Army. The recommendation was made that the ACCSAI study input form be combined with presently existing form(s). Many forms were gathered and studied. The forms most applicable to the ACCSAI program needs were the DD Form 1498 and the study directive. These forms were combined for gathering study information for the ACCSAI program. The resulting forms for study initiation are at figure 6-1. The final forms are in three parts; the DD Form 1498, the ACCSAI attachment to the DD Form 1498 (AAD), and the study directive. The input forms were reviewed and approved by the SAG members. Instructions for their use are documented in appendix L, the DA Pam XX-XX.

RESEARCH AND TECHNOLOGY WORK UNIT SUMMARY				1. AGENCY ACCESSION	2. DATE OF SUMMARY	REPORT CONTROL SYMBOL DD-DR&E(AR) 636
3. DATE PREV SUM'RY	4. KIND OF SUMMARY	5. SUMMARY SCTY	6. WORK SECURITY	7. REGRADING	8. DISP'N INSTR'N	9 LEVEL OF SUM A. WORK UNIT

10. NO./CODES:	PROGRAM ELEMENT	PROJECT NUMBER	TASK AREA NUMBER	WORK UNIT NUMBER
a. PRIMARY				
b. CONTRIBUTING				
c. CONTRIBUTING				

11. TITLE *(Precede with Security Classification Code)*

12. SUBJECT AREAS

13. START DATE	14. ESTIMATED COMPLETION DATE	15. FUNDING ORGANIZATION	16. PERFORMANCE METHOD

17. CONTRACT/GRANT		18. RESOURCES ESTIMATE		
a. DATE EFFECTIVE	EXPIRATION	FISCAL YEARS	a. PROFESSIONAL WORKYEARS	b. FUNDS *(In thousands)*
b. CONTRACT/GRANT NUMBER				
c. TYPE	d. AMOUNT			
e. KIND OF AWARD	f. CUM/TOTAL			

19. RESPONSIBLE DOD ORGANIZATION		20. PERFORMING ORGANIZATION	
a. NAME		a. NAME	
b. ADDRESS *(include zip code)*		b. ADDRESS	
c. NAME OF RESPONSIBLE INDIVIDUAL		c. NAME OF PRINCIPAL INVESTIGATOR	
d. TELEPHONE NUMBER *(include area code)*		d. TELEPHONE NUMBER *(include area code)*	
21. GENERAL USE MILITARY/CIVILIAN APPLICATION:		f. NAME OF ASSOCIATE INVESTIGATOR *(If available)* g. NAME OF ASSOCIATE INVESTIGATOR *(If available)*	

22. KEYWORDS *(Precede EACH with Security Classification Code)*

23. TECHNICAL OBJECTIVE 24. APPROACH 25. PROGRESS *(Precede text of each with Security Classification Code)*

DD FORM 1498 83 MAR EDITION OF MAR 68 IS OBSOLETE. ☆U.S. G.P.O. 1984-421-546/17001

Figure 6-1. Study input form, DD Form 1498

DRAFT

ACCSAI ATTACHMENT TO DD FORM 1498

26. How will the results of this study be used? _____

_____

_____

27. Does this study feed other studies (programmed or proposed)? If so, state study title, POC, and phone number.

Title _____ POC _____ AV _____
Title _____ POC _____ AV _____
Title _____ POC _____ AV _____

28. Decisionmaker for which study will be done: _____

29. Date decisionmaker needs decision: _____

30. Within each category below, check all items that apply.

Broad Focus: ____manpower and personnel ____operations and force structure
AR 5-5 ____concepts and plans ____science, technology, systems and equipment

Echelon: ____sustaining base ____strategic ____tactical ____theater/operational

Mission area: (Must check at least one)

____C2	____air defense	____close combat, light
____comm	____aviation	____combat service support
____IEW	____fire support	____close combat, heavy
____special operations forces		____combat support, NBC
____combat support, engineering, & mine warfare		____combined arms

Refined Focus:

____utility	____requirements/specifications
____capability/effectiveness	____enhancement/solution
____vulnerability	

Keywords:

____air interdiction	____command	____nuclear warfare
____automation	____control	____management
____biological warfare	____conventional forces	____rear area (deep)
____chemical warfare	____cost analysis	____rear area (friendly)
____close combat	____countermeasures	____survivability
____communications	____information	____support
	____interoperability	____training

31. Item - level of system: _____

32. Network of systems: _____

33. C3I facility: _____

34. If making a change, state the reason for the change: _____

_____

Figure 6-1 (continued). Study input form, AAD

OFFICE SYMBOL DATE

SUBJECT:

MEMORANDUM FOR:

1. Purpose of Study Directive.
2. Background.
3. Study Sponsor and Sponsor's Study Director.
4. Study Agency.
5. Terms of Reference.
6. Responsibilities.
7. Literature Search.
8. References.
9. Administration

(AUTHORITY LINE)

Copy Furnished (CF):

Suspenses:

Figure 6-1 (continued). Study input form, directive outline

(b) Study update form. To keep the individual MACOM ACCSAI program offices current on the status of all studies prior to and during their conduct, it was determined that, rather than creating a new form for this purpose, the same forms used for study initiation could be used excluding the study directive. Only the modified information should be provided. In this way, changes may be easily observed.

(c) Study termination form. Taking into consideration advice given concerning the study initiation form, the study termination form was combined with the DD Form 1498 which is used for submitting final study information to DTIC. The form was then in two portions, the DD Form 1498 and an additional ACCSAI study completion form. Later in the development of the forms, the ACCSAI study completion form was dropped leaving only the DD Form 1498. (A DD Form 1498 must be filled out for DTIC for every completed study, so sending a copy to the ACCSAI program office represents little additional work for the study proponent.) A DD form 1473 is required to submit the study report or documentation to DTIC. A sample DD form 1473 is at figure 6-2.

(2) Analysis agency information. For the program office to appropriately schedule studies by time and analysis agency, the capabilities of the analysis agencies must be known. The form shown in figure 6-3 evolved from the study input forms, particularly the AAD. In this way, the program office may more easily assign appropriate studies to analysis agencies.

(3) Tool/data information. Initially, tool/data information was to be gathered on the same form as the study requirements, and were to be identified by the proponent. This approach was changed in two ways: a separate form was used to collect each of tool and data information; and tool and data requirements were to be identified by the analysis agency scheduled to conduct the required study rather than the proponent. The two forms developed are shown in figure 6-4 (tool requirements input) and figure 6-5 (data requirements input). The tool requirements input form was generated using information out of TRADOC Regulation 5-4. The data requirements input form was generated by the ACCSAI project team in coordination with future participants in the ACCSAI program. For directions on use of the forms, reference appendix L.

b. Manipulating information. The manipulation of information involves recording, categorizing, prioritizing, sequencing, scheduling, referencing, consolidating, and disseminating information on studies, tools, or data.

(1) When a set of trial data was manipulated early on in the project to test methodologies, a cut and paste method was used, as were a great deal of precious secretarial sources. Retrieving information on a particular study or tool was particulary difficult.

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved
OMB No 0704-0188
Exp Date Jun 30 1986

1a REPORT SECURITY CLASSIFICATION	1b RESTRICTIVE MARKINGS
2a SECURITY CLASSIFICATION AUTHORITY	3 DISTRIBUTION / AVAILABILITY OF REPORT
2b DECLASSIFICATION / DOWNGRADING SCHEDULE	
4 PERFORMING ORGANIZATION REPORT NUMBER(S)	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a NAME OF PERFORMING ORGANIZATION / 6b. OFFICE SYMBOL *(If applicable)*	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (*City, State, and ZIP Code*)	7b. ADDRESS (*City, State, and ZIP Code*)
8a. NAME OF FUNDING / SPONSORING ORGANIZATION / 8b. OFFICE SYMBOL *(If applicable)*	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (*City, State, and ZIP Code*)	10. SOURCE OF FUNDING NUMBERS

PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.	WORK UNIT ACCESSION NO

11. TITLE (*Include Security Classification*)

12. PERSONAL AUTHOR(S)

13a. TYPE OF REPORT	13b. TIME COVERED FROM _____ TO _____	14. DATE OF REPORT (*Year, Month, Day*)	15. PAGE COUNT

16. SUPPLEMENTARY NOTATION

17 COSATI CODES			18. SUBJECT TERMS (*Continue on reverse if necessary and identify by block number*)
FIELD	GROUP	SUB-GROUP	

19. ABSTRACT (*Continue on reverse if necessary and identify by block number*)

20. DISTRIBUTION / AVAILABILITY OF ABSTRACT ☐ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION
22a. NAME OF RESPONSIBLE INDIVIDUAL	22b. TELEPHONE (*Include Area Code*) / 22c. OFFICE SYMBOL

DD FORM 1473, 84 MAR — 83 APR edition may be used until exhausted. All other editions are obsolete.

SECURITY CLASSIFICATION OF THIS PAGE

Figure 6-2. Study report documentation page

DRAFT

MISSION/CAPABILITIES STATEMENT

1. Agency: _____

2. Mission: _____

_____

_____

_____

3. Capabilities: (PSY) _____

Within each category below, check all items that apply:

a. Broad Focus: ____manpowr and personnel ____operations and force structure
(AR 5-5) ____concepts and plans ____science, technology, systems and equipment

b. Echelon: ____sustaining base ____strategic ____theater/operational
____tactical

c. Mission Area: ____C2 ____air defense ____close combat, light
(Must check ____comm ____aviation ____combat service support
at least one) ____IEW ____fire support ____close combat, heavy
____special operations forces ____combat support, NBC
____combat support, engineering & ____combined arms
mine warfare

d. Refined Focus: ____utility ____vulnerability
____capability/effectiveness ____requirements/specifications
____enhancement/solution

4. Keywords:

___air interdiction	___command	___nuclear warfare
___automation	___control	___management
___biological warfare	___conventional forces	___rear area (deep)
___chemical warfare	___cost analysis	___rear area(friendly)
___close combat	___countermeasures	___survivability
___communications	___information	___support
	___interoperability	___training

5. Limitations: _____

_____

_____

Figure 6-3. Mission/capabilities statement

TOOL REQUIREMENTS INPUT FORM

1. Agency requesting the tool: _____

2. POC: _____ AV: _____

3. Date tool is needed: _____

4. Check only those items which are a minimum requirement for the model:

a. Different Levels & Intensities of Warfare:

		MIN
(1)	Intense Combat in Main Battle Area:	___
(2)	Light Combat as in Screening Force or Economy of Force Action:	___
(3)	Nuclear Warfare:	___
(4)	Chemical Warfare:	___
(5)	Rear Area Operations:	___

b. Varied Tactics:

		MIN			MIN
(1)	Frontal Attack:	___	(2)	Flanking Attack:	___
(3)	Meeting Engagement:	___	(4)	Screening Operation:	___
(5)	Position Defense:	___	(6)	Active Defense:	___
(7)	Spoiling Attack:	___	(8)	Retrograde Operations:	___
(9)	Vertical Envelopment:	___	(10)	Others: Describe	
				_____	___
				_____	___
				_____	___

c. AirLand Battle:

		MIN			MIN
(1)	See Deep (how deep):	___	(2)	Shoot Deep (how deep):	___
(3)	Discontinuous Line of Contact:	___	(4)	Integrated Air/Ground Operations:	___

d. Difficult Terrain:

		MIN			MIN
(1)	Deserts:	___	(2)	Mountains:	___
(3)	River Crossings:	___	(4)	Forests and Jungles:	___
(5)	MOUT:	___	(6)	Snow:	___
(7)	Other Describe:				
	_____	___			
	_____	___			
	_____	___			

f. Critical areas of the World:

		MIN			MIN
(1)	Europe:	___	(2)	SE Asia:	___
(3)	NE Asia:	___	(4)	SW Asia:	___
(5)	Mideast:	___	(6)	Other. Describe:	
				_____	___
				_____	___

Figure 6-4. Tool requirements input form

g. Varied levels of command: MIN

(1) Highest level needs to be played: ___
(2) Lowest level needs to be played: ___
(3) Number of echelons need to be played in a single game: ___

h. Play of arms and services:

	MIN		MIN
(1) All Combat Arms:	___	(2) All Combat Support Arms:	___
(3) Total Logistics: Yes	___	(4) Air Force:	___
(5) Civilians:	___		

i. Play of Allied Forces:

	MIN		MIN
(1) Europe:	___	(2) Mideast	___
(3) Other. Describe:			
_____	___		
_____	___		

j. Play of Varied dispositions:

	MIN		MIN
(1) Continuous Defenses:	___	(2) Discontinuous Defense:	___
(3) Very wide coverage delay and defense:	___	(4) Multiple Attacks:	___

k. Play of Contingency Operations: MIN

(1) Deployability considered: ___
(2) Light Forces examined: ___
(3) Principal contingency areas played: ___
If not all needed, state which principal contingency areas are needed.

l. Play of Degraded Environments:

	MIN		MIN
(1) Smoke:	___	(2) Dust, Haze:	___
(3) Fog, Sleet, Rain:	___	(4) Jamming:	___
(5) Chaff:	___		

m. Battle:

	MIN		MIN
(1) Completed two-sided:	___	(2) Blue only:	___
(3) Red only:	___	(4) Other. Describe:	
		_____	___
		_____	___

n. Smallest unit to which resolved:

	MIN		MIN
(1) Item:	___	(2) Squad:	___
(3) Platoon:	___	(4) Company:	___
(5) Brigade:	___	(6) Division:	___
(7) Corps:	___	(8) Theater:	___

Figure 6-4 (continued).

o. Functional Coverage.

		MIN			MIN
(1)	Close combat(L) including dismounted operation:	___	(2)	Close combat (H):	___
(3)	Fire support:	___	(4)	Engineer & mine warfare:	___
(5)	NBC:	___	(6)	Air defense:	___
(7)	Intel EW:	___	(8)	CSS:	___
(9)	Aviation:	___	(10)	Communications:	___
(11)	Command and control:	___			

5. Other Information:

Figure 6-4 (continued).

DATA REQUIREMENTS INPUT FORM

1. Agency: _____

2. POC: _____ Phone: _____

3. Title of study needing data: _____

4. Will this data be input to a model? YES_____NO_____

5. Date data needed: _____

6. Information products:
   ___Control Information ___Status Information

7. Information architecture boundaries:

   a. Geographic Zone:
      ___Sustaining Base ___Strategic ___Theater(Operational) ___Tactical

   b. Readiness Phases:
      ___Training ___Mobilization/Deployment ___Employment ___Sustainment

8. If, under 7a , Tactical was checked, fill out this block:

TECHNICAL	STAFF (Functional)		COMMAND
	1. General:	2. Functional:	
___enemy	___enemy	___air defense artillery	___enemy
___friendly	___friendly	___combat service support	___friendly
___mission	___mission	___IEW	___mission
___environment	___environment	___fire support	___environment
		___maneuver control	

9. Other Information:

_____
_____
_____
_____
_____
_____

Figure 6-5. Data requirements input form

(2) It was determined that a data base with a data base management system (DBMS) was essential to effectively manipulate the information of studies, tools, and data. A relational DBMS was necessary for the purpose at hand. A relational DBMS would allow retrievals of related studies or tools, particular studies or tools, lists by priority or sequence, and lists by analysis agency or proponent. A hierarchical DBMS would not fit the needs so readily. It was also necessary for the DBMS to work on a widely used and available computer. Several DBMS possibilities were studied. A few were INGRES, Rbase, and dBase III. dBase III was chosen because it operates on IBM-compatible PC, XT, or ATs which are widely available throughout the Army. dBase III is also powerful and easy to use.

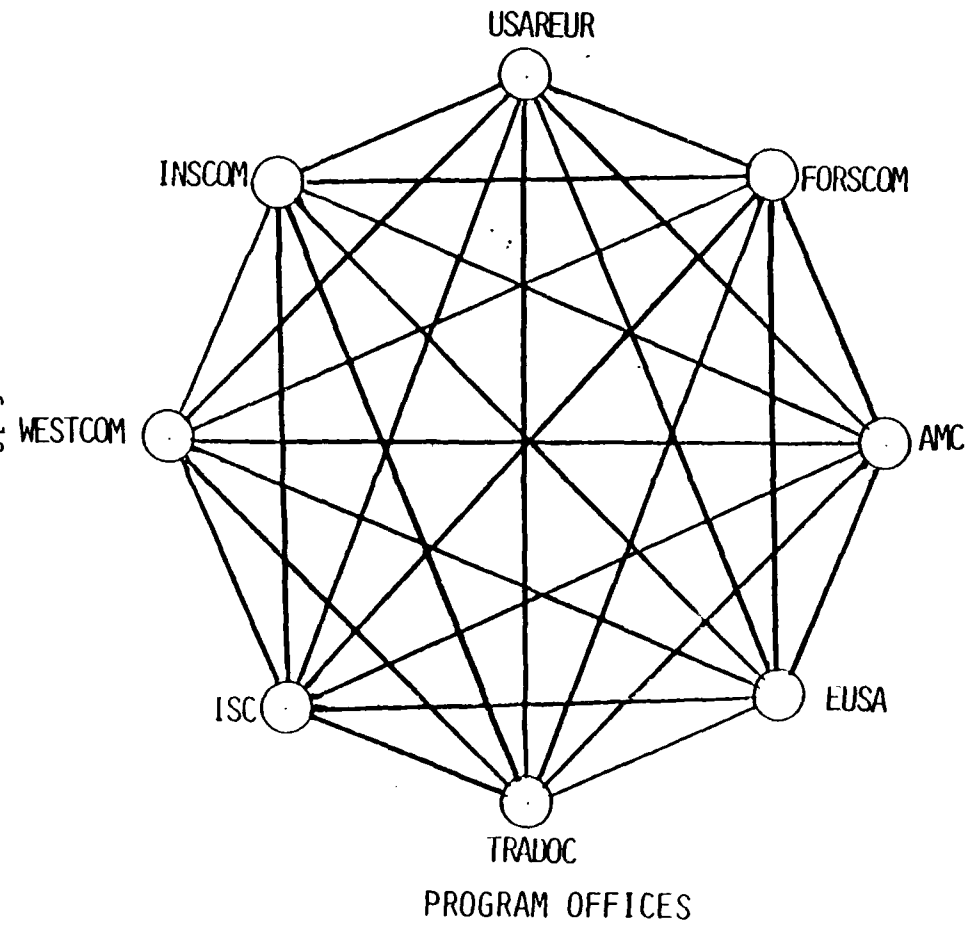
(3) Three data bases are called for, one for studies, one for tools, and one for analysis agency missions and capabilities. The data base for studies is referred to as ACCS STATS; the data base for tools is referred to as ACCS STATS (Tools); the data base for missions and capabilities is the MCDB.

(4) The data bases easily lend themselves to administrative work. Literature searches can easily be conducted. Retrievals may be made on words in a study's or tool's description, or groups of related studies or tools may be retrieved by using categories (see chapter 5). For further details concerning data base design and use, reference Appendix K.

c. Disseminating information. The dissemination of information from the program offices concerns the dissemination of information to proponents and to analysis agencies conducting literature searches and the sharing of information across MACOMs.

(1) Literature searches. If the proponent or analysis agency conducting the literature search is geographically co-located with the program office or tool/data office they are querying, an online query could be made of the data base. If the proponents or analysis agency are not co-located with the program office or tool/data office they are querying, a less efficient, but still effective, telephonic request may be made for certain types of studies or tools/data.

(2) Cross-MACOM information sharing. To ensure Army-wide availability of information concerning ongoing and projected studies, all MACOMs would have to share the information generated from within. The same situation exists for the sharing of tool and data information. Two alternatives were studied for this sharing of information. Figure 6-6 illustrates the first alternative. Within this alternative, each MACOM is responsible for sharing information from their two ACCSAI offices (program office and tool/data office) with every other MACOM via a computer disk containing a copy of the ACCS STATS or ACCS STATS (tools) data base for their MACOM. Figure 6-7 shows a central program office and a central tool/data office. These central offices are referred to as executive agents. Their responsibilities would be to consolidate the information from all MACOM data bases, to send the consolidated data bases back to each MACOM (who would retain both a MACOM-specific data base as well as a consolidated data base), to search for duplicative efforts in their area (either studies or tools/data), to work to eliminate those duplicate efforts, and to retain configuration management over the data base and related software. Alternative two (figure 6-7) was chosen by the SAG due to its more efficient information exchange, and also the increased opportunity to eliminate duplicate efforts across the MACOM.



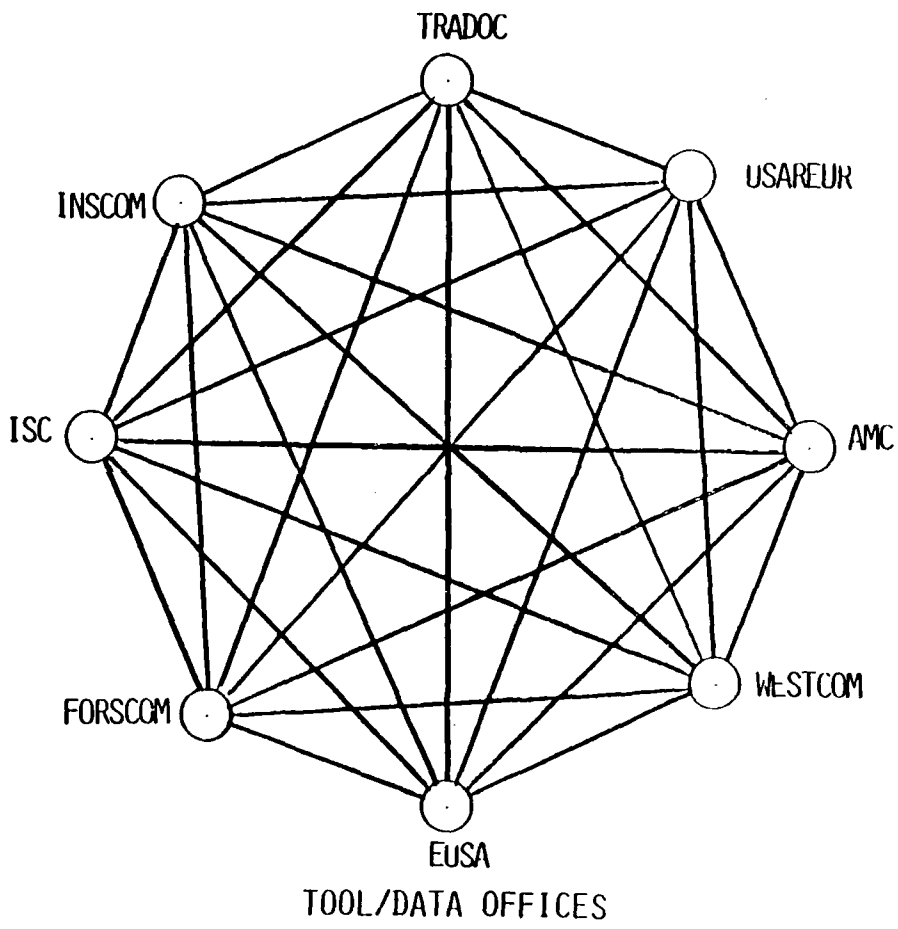
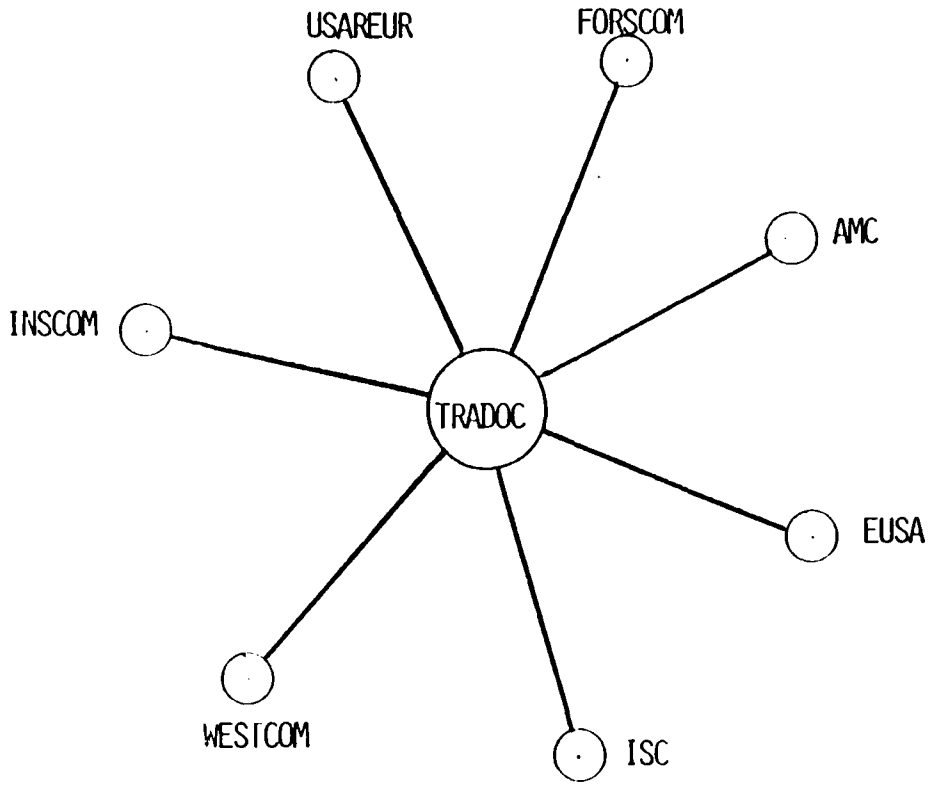


Figure 6-6. Individual information exchange and integration



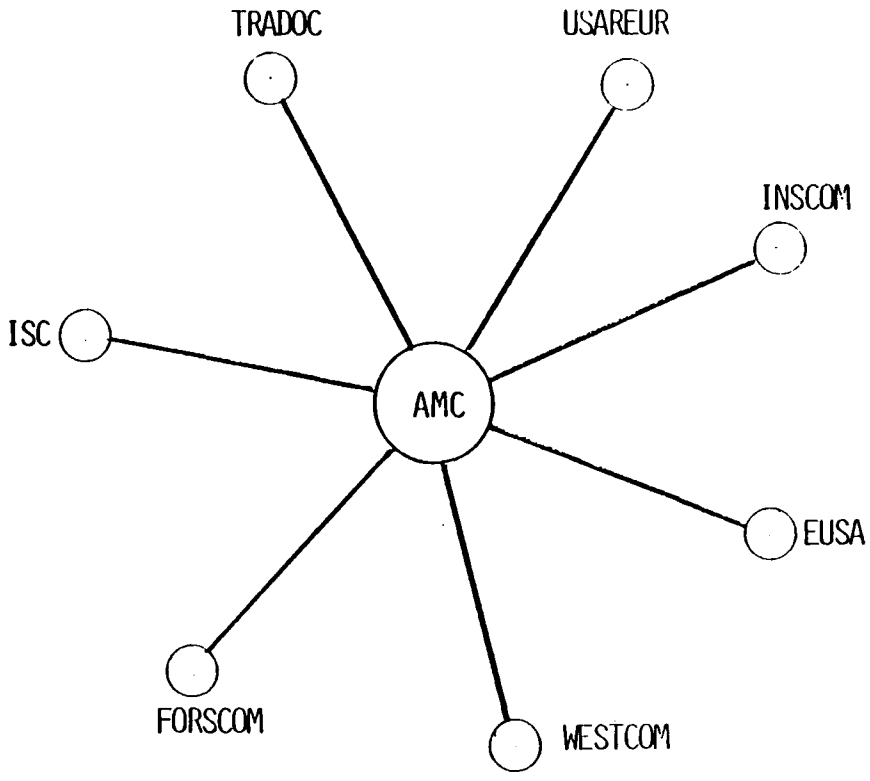


Figure 6-7. Executive agent information exchange and integration

CHAPTER 7

CONCLUSIONS AND RECOMMENDATIONS

7-1. Conclusions.

a. The product resulting from this study is the proposed program documented in the DA Pam XX-XX and proposed changes to AR 11-39. These documents are published in appendixes L and M.

b. The proposed DA Pam XX-XX outlines:

(1) The types of studies to be included in the Army Command and Control System Analysis Integration (ACCSAI) program.

(2) The responsibilities of the participants in the ACCSAI program, the schedules and cycles involved with the ACCSAI program, and all necessary forms and instructions for participation in the ACCSAI program.

c. The material in the proposed DA Pam XX-XX is intended to:

(1) Act as a guide to the management components of the ACCSAI program for the maintenance of the ACCSAI program.

(2) Educate the action officer regarding the Army management requirements associated with the initiation, conduct, and termination of studies concerning the Army Command and Control System.

(3) Assist the action officer with the fulfillment of the Army management requirements referred to above.

7-2. Recommendations. Recommend the implementation of the ACCSAI program as documented in appendix L (DA Pam XX-XX). Further recommendations follow.

a. Categorization and data base use. The data base system designed through this project is recommended for use for the information manipulations as well as information sharing across MACOMs. It is necessary for the data bases to be of standard format and use.

b. Sequencing. There are three steps in sequencing,

(1) Determine the study links. Recommend use of the refined focus categories on the AAD attachment to DD Form 1498.

(2) Input the study links into the computer for logic verification. Recommend use of the link/verify program documented in appendix I.

(3) Ordering and extracting sequences of studies. Recommend use of the extraction program in appendix I.

c. Scheduling. All study sequences must be scheduled for conduct based on priority, deadline requirements, and available resources. The scheduling program documented in appendix J is recommended to assist with scheduling.

d. Prioritization. For prioritizing, the modified eigenvector method described in chapter 5 is recommended. It is a time-economical method which permits quantification of the objectives determined important for prioritizing. The final ranking is based on the studies' overall contribution goal. Two software packets are recommended. The first will find the principle eigenvector. (The use of either Topsis or Expert Choice is recommended.) The second will use the weights from the principle eigenvector together with the contribution value of each study to each criterion to develop a contribution score (recommend the use of the software documented in appendix H).

APPENDIX A
STUDY DIRECTIVE

DEPARTMENT OF THE ARMY

HEADQUARTERS UNITED STATES ARMY TRAINING AND DOCTRINE COMMAND
FORT MONROE, VIRGINIA 23651-5000

REPLY TO
ATTENTION OF

ATCD-AS

2 3 JUL 1986

SUBJECT: TRADOC Study Directive: Army Command and Control System (ACCS) Analysis Integration Project (AIP)

Commander, U.S. Army Combined Arms Center & Ft Leavenworth, ATTN: ATZL-CAC, Fort Leavenworth, KS 66027
Commander, TRADOC Analysis Center, ATTN: ATOR-CG, Fort Leavenworth, KS 66027

1. PURPOSE OF STUDY DIRECTIVE. This letter directs an Army Command and Control System (ACCS) Analysis Integration Project (AIP) to design, develop, and recommend a management program by which ACCS studies, projects, tools and test or exercise data may be integrated Army-wide. The management program developed through the ACCS AIP will be implemented by the DA assigned executive agent of the program.

2. REFERENCES.

a. White Paper, ODUSA (OR), 18 Jan 85, C3I Analysis.

b. Memo, DUSA (OR), 11 Apr 85, C3I Analysis.

c. Letter, Cdr, TRADOC, 10 May 85, C3I Analysis.

d. Five Year ACCS Analysis Master Plan, FY 87-FY 91.

e. Report, CACDA, Aug 81, Command and Control Evaluation Effort (C2E2).

3. STUDY SPONSOR. HQDA, SAUS-OR, Mr. Sizelove, AV 225-0384.

4. STUDY AGENCIES.

a. Proponent. CACDA, ATZL-CAC-D, Mr. Kitarogers, AV 552-4721.

b. Supporting analytic agency. TRAC, ATOR-CS-I, Mr. Tolin, AV 552-4234/4309.

5. STUDY MONITOR. HQ TRADOC, ATCD-AS, Mr. Murray, AV 680-2208/9.

6. LITERATURE SEARCH. The study agencies will conduct a literature search in accordance with AR 5-5, paragraph 3-3b and AR 5-14, paragraph 4-3a.

7. TERMS OF REFERENCE.

a. Problem. The large number of activities addressing command and control issues, the overlap of command and control responsibilities, and the specialization and limited interaction among combat developers have resulted in:

(1) Important issues in command and control not being addressed.

(2) Insufficient integration between and among analyses, tools, and data collection during tests and exercises.

(a) No prioritization established for command and control studies.

(b) Required data and tools unavailable for application.

(c) Analyses not being conducted in logical sequence.

(d) Duplication in analysis efforts.

(3) Lack of an essential ACCS analysis management structure.

b. Objectives.

(1) To develop a management program which:

(a) Ensures important issues in the ACCS area are being addressed.

(b) Determines requirements to fill ACCS tool and data deficiencies.

(c) Integrates ACCS analyses, tools, and data collection during tests and exercises.

1 Prioritizes proposed ACCS studies.

2 Sequences proposed ACCS studies.

3 Sequences tool creation and data collection in order to fill requirements of projected studies.

4 Reduces duplication in ACCS analyses and tool efforts.

(2) To recommend the management structure for the ACCS AIP.

c. Scope. The ACCS AIP will address:

(1) All Army-wide ACCS issues.

(a) Friendly and threat C2 issues.

(b) All ACCS zones (sustaining base, strategic, operational, tactical).

(c) ACCS issues across all functions (fire support, air defense, IEW, aviation, C2, etc.).

(2) ACCS analyses.

(3) ACCS tools (models, data bases, etc.)

(4) ACCS tests.

(5) ACCS exercises.

d. Time Frame. The ACCS AIP will develop a management program which will address studies, analyses, and tool creation projected for the subsequent fiscal year and up to five fiscal years in the future. The program will be updated yearly.

e. Essential Elements of Analysis (EEA).

(1) What can be done to make the program of most benefit to the users/participants?

(a) What reports would be beneficial to the users?

(b) What input is required to generate reports beneficial to users?

(c) What format would best facilitate the gathering of necessary input from study agencies?

(2) How would the ACCS AIP work?

(a) How can ACCS analyses be prioritized to reflect DA and MACOM's priorities?

(b) How can ACCS analyses and tool creation be integrated Army-wide to greater facilitate their use?

(c) How can analyses be sequenced in such a way that they can provide input to each other in the most meaningful way?

(d) How can ACCS analyses and tools be integrated to help eliminate effort duplication?

(3) What are the alternative structures for managing the ACCS AIP?

(4) What is the recommended structure for managing the ACCS AIP?

(5) Who are the appropriate ACCS AIP participants?

(6) How can the ACCS AIP be kept updated?

(a) How can information concerning future (proposed) ACCS studies and projects be recorded, retrieved, and disseminated easily and meaningfully?

(b) How can information concerning future (proposed) tool creation be recorded, retrieved, and disseminated easily and meaningfully?

(c) How can information on presently scheduled tests and exercises be recorded, retrieved, and disseminated to facilitate the integration of data collection with studies and tool creation.

(7) What existing or new Army Regulation(s) should control the ACCS AIP?

f. Constraints.

(1) The ACCS AIP will address only the ACCS area.

(2) The ACCS AIP must be completed by 1 Dec 86 in order to provide input to the AR 5-5 study program for FY88.

g. Alternatives. To be developed in the study plan.

h. Methodology. The following tasks will be developed and described in detail in the study plan:

(1) Coordination of analysis documents.

(2) Determine ACCS Analysis Integration Management Structure.

(3) Determine categorical divisions.

(4) Determine study sequencing methodology.

(5) Determine sequencing methodology for data collection and tool creation.

(6) Determine study prioritization methodology.

(7) Determine cross study/tool analysis methodology.

(8) Develop descriptor codes for use in an automated database.

(9) Design the Database for ACCS Tools and Analyses Management (DATAM).

(10) Determine program input collection methodology.

(11) Coordination concerning proposed ACCS Analysis Integration methodologies.

(12) Document program in final report.

(13) Determine consultative services required.

8. SUPPORT AND RESOURCE REQUIREMENTS.

a. HQ TRADOC.

(1) Establish and chair the Study Advisory Group (SAG).

(2) Establish the priority and availability of analytic support required to complete the study.

(3) Provide technical assistance as required.

(4) Review and approve the study plan and reports.

b. CAC.

(1) Develop detailed study plan.

(2) Conduct the study assisted as appropriate by the TRADOC centers, schools, and agencies. Assistance required by the study agency will be detailed in the study plan.

(3) Prepare and submit reports required by AR 5-5 directly to HQ TRADOC, ATCD-AS.

(4) Provide briefings on the status of the study to the SAG or HQ TRADOC as requested.

(5) Develop Project Coordination Sheets (PCS) as required.

(6) Limit the study effort at CAC to .5 Professional Staff Years (PSY).

c. TRAC.

(1) Assist CAC to develop the study plan.

(2) Provide support as requested by CAC.

(3) Limit the study effort at TRAC to 1.8 PSY.

d. TRADOC Centers, Schools, and Agencies. Provide support as requested by CAC.

e. HQDA. Participate as a SAG member.

9. ADMINISTRATION.

a. Milestone Schedule.	o/a Date
(1) PCS	13 Jun 86
(2) Draft Project plan	30 Jul 86
(3) Initial SAG	14 Aug 86
(4) Mid-term SAG	28 Oct 86
(5) Complete final report	24 Nov 86
(6) Final SAG	16 Dec 86

b. Control Procedures. The ACCS AIP will be managed by CACDA C3I.

(1) HQ TRADOC will appoint and chair a SAG to guide and monitor the study in accordance with AR 5-5 and DA Pam 5-5. TRADOC Reg 5-3 implements AR 5-5 for TRADOC schools and centers.

(2) Documents required for submission for the ACCS AIP include:

(a) DD Form 1498 (Research and Technology Work Unit Summary).

ATCD-AS
SUBJECT: TRADOC Study Directive: Army Command and Control System (ACCS) Analysis Integration Project (AIP)

(b) TRADOC Study Program Description Sheet.

(c) ACCS Analysis Category Form.

c. Study Format. Study report format will be IAW directions contained in TRADOC Reg 11-8.

d. Action Control Number (ACN). The ACN is 073120. The ACCS AIP is not listed in the FY 86 TRADOC AR 5-5 Study Program. The ACCS AIP is programed in the FY 87 TRADOC AR 5-5 Study Program under category H and priority 39.

FOR THE COMMANDER:

GEORGE M. KRAUSZ
Major General, GS
Deputy Chief of Staff
for Combat Developments

CF:
HQDA (SAUS-OR/DAMO-FDZ/DAMO-FDC/
DAPE-PSR/DAIM-ADC/DAMI/DAMI-CSC)
OJCS WASH DC (JAD)
HQ USAF (AFSA-SAGR)
CDR
AMC (AMCDE-SB)
CECOM (AMSEL-ATDD-SC)
USALOGC (ATCL-CAR)
USAISC (AS-PLN-TT)
CGSC (ATZL-SWT-C)
OTEA (CSTE-C4)
CATA (ATZL-TAU)
DIR
USACAA (CSCA-MSM-O)
TRAC WSMR NM (ATOR-T-CAB)
AMSAA (AMXSY-CC)
AMMO Ft Leavenworth, KS (ATZL-CAN-DO)
ARI Ft Leavenworth, KS (PERI-SL)

APPENDIX B

ESSENTIAL ELEMENTS OF ANALYSIS (EEA)

1. General. The EEA listed here differ from those listed in the study plan. The difference is a result of the study process; as the problem became more clearly defined, so did the EEA. The EEA listed here are the final ACCSAI project EEA.

2. Final EEA.

a. What can be done to make the program most beneficial to the users/participants?

(1) What reports would be beneficial to the users?

(2) What input is required to generate reports beneficial to users?

(3) What format would best facilitate the gathering of necessary input from study agencies?

b. How would the ACCS Analysis Integration Program work?

(1) How can ACCS analyses be prioritized to reflect DA and MACOM's priorities?

(2) How can ACCS analyses and tool creation be integrated Army-wide to greater facilitate their use?

(3) How can analyses be sequenced in such a way that they can provide input to each other in the most meaningful way?

(4) How can ACCS analyses and tools be integrated to help eliminate effort duplication?

c. What are the alternative structures for managing the ACCS Analysis Integration Program?

d. What is the recommended structure for managing the ACCS Analysis Integration Program?

(1) Who is the most appropriate manager for the ACCS Analysis Integration Program?

(2) Who is the most appropriate executive agent for the ACCS Analysis Integration Program?

(3) Who are the most appropriate ACCS Analysis Integration Program participants?

e. How can the ACCS Analysis Integration Program be updated?

(1) How can information concerning future (proposed) ACCS studies and projects be recorded, retrieved, and disseminated easily and meaningfully?

(2) How can information concerning future (proposed) tool creation be recorded, retrieved, and disseminated easily and meaningfully?

(3) How can information on presently scheduled tests and exercises be recorded, retrieved, and disseminated to facilitate the integration of data collection with studies and tool creation?

f. What existing or new Army regulation(s) should control the ACCS Analysis Integration Program?

APPENXIX C

MANPOWER COSIS

C-1. General. The SAG requested that an estimate of manpower resources be provided to execute the proposed program through its annual cycle. lime computations by MACOM were performed by decomposing program office and tool/data office responsibilities to various annual cycle tasks (figure C-1).

C-2. Assumptions.

a. The two types of studies (deliberate and quick-response - chapter 2) require different management procedures and therefore different amounts of time to process.

b. The quantity of studies was estimated by an analysis of suborganizations within MACOMs and verification by SAG members (tables C-1 and C-2).

c. The quantity of studies in table C-2 represents the number of deliberate studies for one year. To determine the quantity of studies that require processing by each MACOM program office, it was assumed that 80% of the current year quantity would be known, in ACCS STATS, and would require processing. Further, 60% would be known for one year later, 30% for two years later, 20% for three years later, and 10% for further out years. Thus, 200% of an estimated one-year quantity of deliberate studies would require processing (figure C-2).

d. Based on coordination among MACOMs, it was determined that there are twice as many quick-response studies than deliberate studies. Half of the quick-response studies would be in ACCS STATS at any time for processing (figure C-3). Therefore, the quantity of studies that each MACOM must manage is 300% (200% deliberate plus 100% quick-response) of the one-year quantity of deliberate studies.

e. The estimated times required to identify duplicate deliberate studies are shown in table C-3. Since studies are sorted into categories for processing, distributions of the number of studies by categories were assumed.

(1) For TRADOC, there would be three category levels for intra-MACOM studies (table C-4). In the first level, there are four subgroups with a distribution of .4/.3/.2/.1. In the second level, there are four subgroups with a distribution of the .8/.1/.05/.05. In the third level, the distribution of the .8 subgroup from the second level has a distribution of .25/.20/.15/.15/.10/.05/.04/.03/.02/.01. The distribution for inter-MACOM study requirements would be .4/.3/.2/.1 and .4/.3/.2/.1 over two category levels.

(2) For AMC and ISC, there would be two category levels, each with a distribution of .4/.3/.2/.1 (table C-5).

(3) For the remainder of MACOMs, there would be one category level with a distribution of .4/.3/.2/.1 (table C-6).

TOTAL TIME	=	DELIBERATE STUDY PROCESSING VERIFY/CATE- GORIZE PRIORITIZING SEQ/SCHED	+	DELIBERATE STUDY ANNUAL CYCLE DUPLICATION IDENTIFICATION VOID IDENTIFICATION ADMIN GUIDANCE PREPARATION	+	QUICK-RESPONSE DUPLICATION IDENTIFICATION ADMIN	+	ADMIN CORRESPONDENCE PHONE BRIEFING/MTG PREP	MEETINGS INTER- MACOM INTRA- MACOM T/DO

MACOM TOOL/DATA OFFICE

TOTAL TIME	=	DELIBERATE TOOL/DATA PROCESSING DUPLICATION IDENTIFICATION ADMIN	+	QUICK-RESPONSE TOOL/DATA PROCESSING DUPLICATION IDENTIFICATION ADMIN	+	COORD W/TEST COMMUNITY	+	ADMIN CORRESPONDENCE PHONE BRIEFING/MTG PREP	MEETINGS INTER- MACOM INTRA- MACOM PO

Figure C-1. Time computations, MACOM program office

Table C-1. Number of TRADOC ACCS studies per year

	LOW	HIGH
INF	3	5
ARMOR	3	5
ENGR	3	5
AVN	3	15
FS	3	15
SIG	5	15
IEW	10	20
MP	3	5
CHEM	3	5
ORD	3	5
TRANS	3	5
MED	3	5
SOF	3	5
SSC	3	15
LOGC	9	25
CAC	15	40
	75	190

AD-A192 433 ACN 73120 ARMY COMMAND AND CONTROL SYSTEM ANALYSIS 2/2
INTEGRATION (ACCSAI) S. (U) ARMY TRADOC ANALYSIS
COMMAND FORT LEAVENWORTH KS D KROENING ET AL. FEB 87
UNCLASSIFIED TRAC-F-TD-2587 F/G 25/5 NL

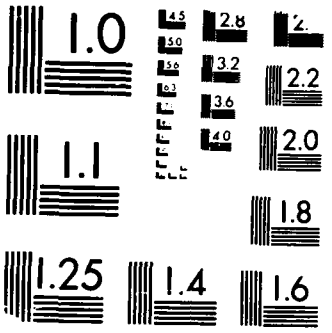


Table C-2. Annual ACCS study requirements volume, deliberate

	LOW	HIGH
TRADOC	75	190
AMC	35	100
ISC	20	50
INSCOM	20	50
FORSCOM	10	25
USAREUR	10	25
WESTCOM	5	10
EUSA	5	10
	180	460

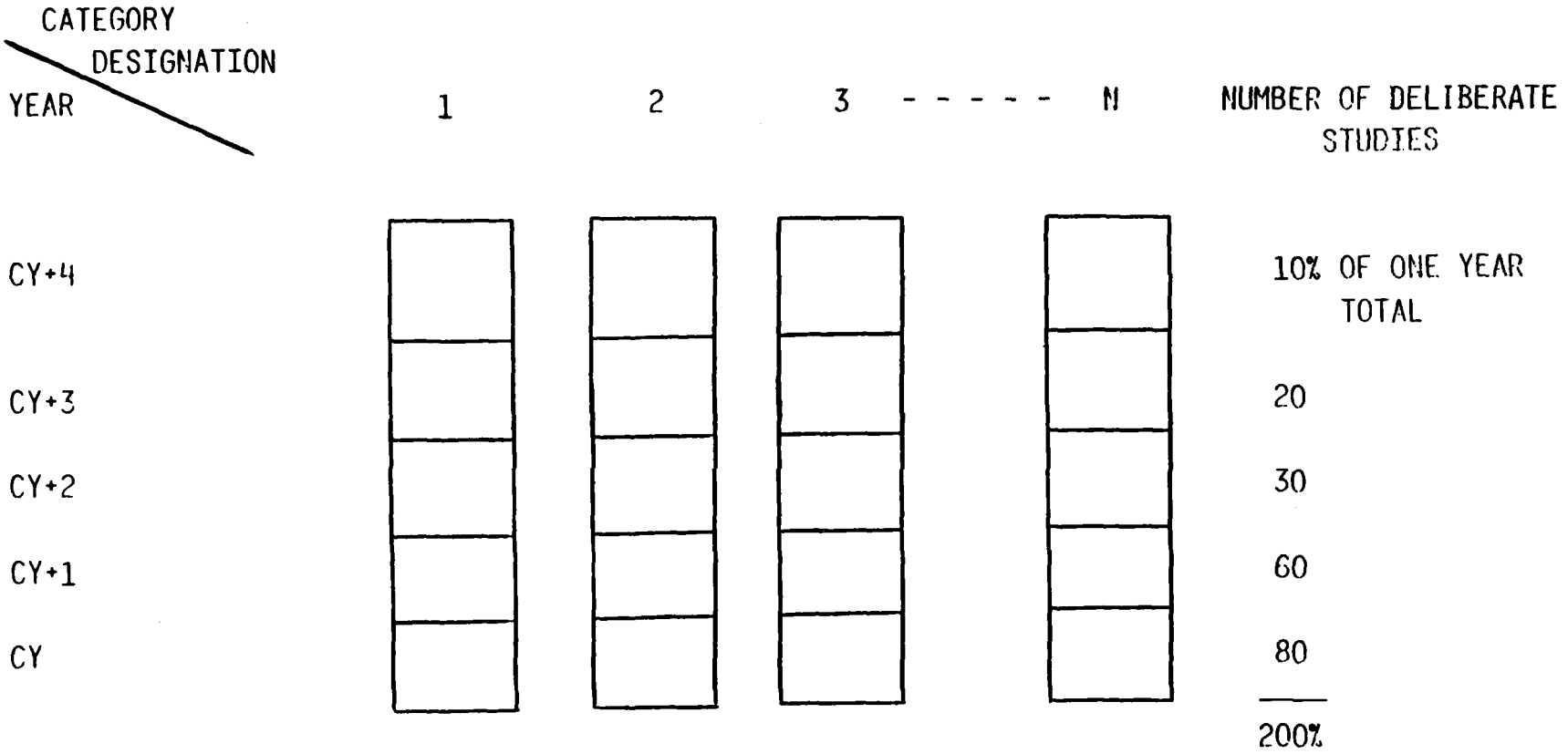


Figure C-2. ACCS analysis requirements projections

DELIBERATE: 200% OF ANNUAL ACCS STUDY REQUIREMENTS

*QUICK-RESPONSE: 100% OF ANNUAL ACCS STUDY REQUIREMENTS

*QUICK-RESPONSE VOLUME = 200% OF ANNUAL ACCS STUDY VOLUME WITH HALF IN ACCS STATS AT ANY TIME.

Figure C-3. Quantity of study requirements in ACCS STATS (number that require coordination and integration)

Table C-3. Time required to identify duplications of deliberate studies

* No. Studies		** Time
5	-	2 hours
10	-	4 hours
15	-	1 day
20	-	2 days
25	-	3 days
30	-	4 days
40	-	5 days
45	-	6 days
50	-	7 days
55	-	8 days
60	-	9 days
75	-	10 days
80	-	11 days
90	-	12 days
100	-	13 days

* Number of studies in a category.

** Time required to identify duplications within categorized studies.

Table C-4. TRADOC man-day requirement to identify duplicate deliberate studies

Intra-MACOM Distribution:
.4/.3/.2/.1 // .8(.25/.20/.15/.10/.05/.04/.03/.02/.01)/.1/.05/.05/
Inter-MACOM Distribution:
.4/.3/.2/.1 // .4/.3/.2/.1

	# Study Requirements/Professional Man-Days								
DIST	SR=225	/ PMD	SR=570	/ PMD	DIST	SR=700	/ PMD	SR=2000	/ PMD
.08	18	2	46	6	.16	112	15	320	40
.064	14	1	36	5	.12	84	11	240	31
.048	11	.5	27	3	.08	56	8	160	22
.048	11	.5	27	3	.04	28	4	80	11
.032	7	.5	18	2	.12	84	11	240	31
.016	4	.5	9	.5	.09	63	9	180	24
.0128	3	}	7	.5	.06	42	5	120	15
.0096	2	} .5	5	.5	.03	21	2	60	9
.0064	1		4	}	.08	56	8	160	22
.0032	1		2	} .5	.06	42	5	120	15
.04	9	.5	23	3	.04	28	4	80	11
.02	5	.5	11	.5	.02	14	1	40	5
.02	5	.5	11	.5	.04	28	4	80	11
.0624	14	1	36	5	.03	42	5	60	9
.048	11	.5	27	3	.02	14	1	40	5
.036	8	.5	21	2	.01	7	.5	20	2
.036	8	.5	21	2			93.5		258.0
.024	5	.5	14	1					
.012	3	}	7	.5					
.0096	2	} .5	5	.5					
.0072	2	}	4	}					
.0048	1		3	} .5					
.0024	1		1						
.03	7	.5	17	1					
.015	4	.5	8	.5					
.015	4	.5	8	.5					
.04	9	.5	23	3					
.032	8	.5	18	2					
.024	5	.5	14	1					
.024	5	.5	14	1					
.016	4	}	9	.5					
.008	2	} .5	5	.5					
.0064	1		4	}					
.0048	1		3	} .5					
.0032	1		2	}					
.0016	1		1						
.02	5	.5	11	.5					
.01	2	}	6	.5					
.01	2	} .5	6	.5					
.02	5	.5	11	.5					

Table C-4 (Cont.)

DIST	# Study Requirements/Professional Man-Days SR=225 / PMD		SR=570 / PMD	
.016	4		9	.5
.012	3	.5	7	.5
.012	3		7	.5
.008	2	.5	5	
.004	1		2	.5
.0032	1		2	
.0024	1		1	
.0016	1		1	
.0008	1		1	
.01	2		6	
.005	1		3	.5
.005	1		3	
		17.0		55.0

Table C-5. AMC/ISC man-day requirements to identify duplicate deliberate studies

Distribution: .4/.3/.2/.1 // .4/.3/.2/.1

DIST	# Study Requirements/Professional Man-Days SR=60	PMD	SR=100	PMD	SR=150	PMD	SR=300	PMD
.16	10	.5	16	1	24	3	48	7
.12	7	.5	12	.5	18	2	36	5
.08	5	}	8	.5	12	1	24	3
.04	2	} .5	4	.5	6	.5	12	.5
.12	1		12	.5	18	2	36	5
.09	5	.5	9	.5	14	1	28	4
.06	4	}	6	.5	9	.5	18	2
.03	2	} .5	3		5	.5	10	.5
.08	5	.5	8	.5	12	.5	24	3
.06	4	}	6	.5	9	.5	18	2
.04	2	} .5	4	}	6	.5	12	.5
.02	1		2	} .5	3		6	.5
.04	2	}	4	}	6	.5	12	.5
.03	2	} .5	3	} .5	5	}	10	.5
.02	1		2	}	3	} .5	6	.5
.01	1		1		2	}	4	.5
		4		6		13		35

Table C-6. INSCOM/FORSCOM/USAREUR/WESTCOM/EUSA man-day requirements to identify duplicate studies

Distribution: .4/.3/.2/.1

DIST	# Study Requirements/Professional Man-Days SR=15	PMD	SR=30	PMD	SR=60	PMD	SR=75	PMD
.4	6	.5	12	.5	24	3	30	4
.3	5	.5	9	.5	18	2	22	2
.2	3	.5	6	.5	12	.5	15	1
.1	1	.5	3	.5	6	.5	8	.5
		2		2		6		7.5

f. The time required to identify duplicate quick-response studies is one-half a man-day each. The quantity of quick-response studies is twice the number of deliberate studies (tables C-2 and C-7).

g. The time required to sequence and schedule deliberate studies would equal the time required to identify duplications. The time required to verify and categorize is two hours each (table C-7).

h. The time required to identify duplicate tool/data requirements for deliberate studies would be 50% of the time required to identify duplicate deliberate study requirements (table C-8).

i. The time required to identify duplicate tool/data requirements for quick-response studies would be 25% of the time required to identify duplicate quick-response study requirements (table C-8).

j. Time required for meetings, phone calls, and correspondence was based on tasks identified in the annual cycle.

k. There are 209 man-days per professional staff year.

C-3. Computations.

a. The total time required by each MACOM program office and tool/data office is computed in man-days in tables C-7 and C-8. Two options were identified, one for individual inter-MACOM coordination, and the other for executive agent MACOM coordinating (see chapter 6). Time was added to the TRADOC program office to identify inter-MACOM duplicate deliberate study requirements, and time was added to the AMC tool/data office to identify inter-MACOM duplicate deliberate tool/data requirements (table C-9). The times in table C-9 are expressed in professional staff years.

C-4. Conclusions.

a. The total manpower requirement for the ACCSAI program is shown in table C-10.

b. Many of the tasks identified for the proposed program are existing functions. The additional manpower requirements to execute the ACCSAI program are estimated to be:

2 - TRADOC program office
1 - AMC program office
1 - AMC tool/data office

Table C-7. Program office manpower requirements (professional man-days)

	Deliberate Study Processing			+ Deliberate Annual Cycle				+ QR Cycle		+ Admin				Meetings		= Total Time	
	Pri	Sec Sch	Verify & Cat	Dup (4yr)	Void	Admin	Guide Prep	Dup	Admin	Corres	Phone	Brief Prep	Inter	Intra MACOM	T/DO	(PMD)	(PSY) @ 209
TRADOC	10	55 17	48 19	55 17	10	5	10	190 75	2	15	15	5	6	10	4	420 220	2.0 1.1
AMC	10	35 6	25 9	35 6	10	5	10	100 35	2	15	15	5	6	8	4	285 146	1.4 0.7
ISC	10	13 4	12 5	13 4	10	5	5	50 20	2	15	10	5	6	6	2	164 109	0.8 0.5
INSCOM	5	6 2	12 5	6 2	5	3	5	50 20	2	10	5	5	6	6	2	128 83	0.6 0.4
FORSCOM	5	8 2	6 2	8 2	5	3	5	25 10	1	10	5	5	6	4	2	98 67	0.5 0.3
USAREUR	5	8 2	6 2	8 2	5	3	5	25 10	1	10	5	5	10	4	2	102 71	0.5 0.3
WESTCOM	5	2	2 1	2	5	3	5	10 5	1	10	5	5	10	4	2	71 65	0.3
EUSA	5	2	2 1	2	5	3	5	10 5	1	10	5	5	10	4	2	71 65	0.3

For executive agent option add $\frac{258}{94}$ to TRADOC for inter-MACOM deliberate duplication processing

$$\frac{420}{220} + \frac{258}{94} = \frac{678}{314} = \frac{3.2}{1.5}$$

Table C-8. Tool/data office manpower requirements (professional man-days)

	Deliberate Annual Cycle		+ QR Cycle		+ Coord w/ test Comm	+ Admin				+ Meetings		= Total Time	
	Dup	Admin	Dup	Admin		Corres	Phone	Brief Prep	Inter MACOM	Intra MACOM	P/O	(PMD)	(PSY) @ 209
TRADOC	28/9	5	48/19	2	10	10	10	3	3	5	4	128/80	0.6/0.4
AMC	17/3	5	25/9	2	10	10	10	3	3	5	4	94/64	0.4/0.3
ISC	3	5	12/5	2	10	10	5	3	3	3	2	58/51	0.3
INSCOM	2	3	12/5	1	5	5	5	2	3	3	2	43/36	0.3/0.2
FORSCOM	2	3	6/3	1	5	5	5	2	3	3	2	37/34	0.2
USAREUR	2	3	6/3	1	2	5	5	2	5	2	2	39/36	0.2
WESTCOM	2	3	2	1	2	5	5	2	5	2	2	31	0.2
EUSA	2	3	2	1	2	5	5	2	5	2	2	31	0.2

For executive agent option add 129/47 to AMC for Inter-MACOM deliberate duplication processing

$$\frac{94}{64} + \frac{129}{47} = \frac{223}{111} = \frac{1.1}{0.5}$$

Table C-10. ACCSAI program manpower resource estimates

ASSUMED QUANTITY OF STUDY REQUIREMENTS / STUDY REQUIREMENT	LOW 180 STUDIES/YEAR (500 FORECASTED)	HIGH 460 STUDIES/YEAR (1400 FORECASTED)
INDIVIDUAL INTER-MACOM COORDINATION	5.9 PSY*	8.8 PSY*
EXECUTIVE AGENT INTER-MACOM COORDINATION	6.5 PSY*	10.0 PSY*

* DOES NOT REPRESENT ADDITIONAL (NEW) RESOURCE REQUIREMENTS.

APPENDIX D

FOLLOW-ON ACTIONS: STAFFING AND PROGRAM IMPLEMENTATION

D-1. Introduction. There are two follow-on actions resulting from the ACCSAI project. They are described in the paragraphs below.

D-2. Staffing.

a. The technical report will be staffed and distributed by the ACCSAI project team members.

b. The proposed program documented in appendix L and M, this technical document, must be staffed at various levels.

(1) CACDA C3I will staff to TRADOC schools and centers.

(2) HQ TRADOC will staff within the HQ TRADOC.

(3) DA ODCSOPS will staff to all participating MACOMs and within HQDA.

c. If changes are to be made to either the DA Pam XX-XX or the recommended alterations to AR 11-39, CACDA C3I is responsible but TRAC-FLVN, CCAD, will provide consultative services as required.

D-3. Implementation. Upon approval by DA, both the DA Pam XX-XX and the changes to AR 11-39 must be published and disseminated. DA ODCSOPS is responsible for ensuring accomplishment of these implementing tasks.

APPENDIX E

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APPENDIX F

SAG MEMBERSHIP

Organization	Status	Office Symbol	AUTOVON
HQ TRADOC			
BG Thomas Foley	Chairman	ATCD-ZB	680-2061
Mr. Ellison Vickory	Member	ATCD-C	680-3161
COL Tony Brinkley	Member	ATCD-A	680-3158
Mr. Bob Chester	Observer	ATTG-YS	680-3455
Mr. Richard Ware	Observer	ATOR-MP	680-2208
Mr. John Campbell	Member	ATCD-CB	680-3271
CW3 Michael Stoddard	Observer	ATIS-T	680-2664
Mr. Chad Burchett	Observer	ATTG-YA	680-3455
CPT Mike Belter	Observer	ATDO-J	680-2303
Mr. Mark Murray	Observer	ATOR-RM	680-2208
Lauran Winter	Observer	ATCD-AS	680-3117
MAJ Paul Oskvareu	Observer	ATCD-TP	685-3681
CPT Bob Risney	Observer	ATCD-CB	680-3271
HQDA			
COL Richard E. Supinski	Member	DAMO-FDC	223-2260
LTC Donald McCraney	Member	DAMO-FDC	223-9360
Mr. J. Douglas Sizelove	Member	SAUS-OR	225-0384
Mr. Bill Barr	Observer	DACS-DMO	227-0026
AMC			
Mr. James Brown	Member	AMCDE-SB	284-9301
USAISC			
LTC James Tomko	Member	AS-PLN-TE	879-0627
MAJ Kenneth White	Observer	AS-PLN-TT	879-6415
USACAC			
CPT William Derr	Observer	ATZL-TAS-T	552-2495
Mr. Roland Groover	Study Team	ATZL-CAD-D	552-4721
Mr. George Kitarogers	Study Team	ATZL-CAD-D	552-4721
LOGC			
Mr. Henry Crites	Observer	ATCL-CAR	687-3861
SSC			
CPT Kevin Olson	Observer	ATSG-DDB	699-3804

Organization	Status	Office Symbol	AUTOVON
TRAC (FLVN)			
Ms. Margaret Fratzel	TRAC (C3I) Coordinator	ATOR-CR	552-5511
Mr. Don Kroening	Study Team	ATOR-CSC	552-4234
Mr. Larry Tolin	Study Team	ATOR-CSD-I	552-4234
Ms. Sara Tisdel	Study Team	ATOR-CSD-I	552-4234
Ms. Edye Ewbank	Study Team	ATOR-CSD-I	552-4234
TRAC (WSMR)			
Mr. Gale Mathiason	Observer	ATOR-TC	258-2406
OTEA			
Mr. Paul Kampe	Observer	CSTE-C4	289-2425
CECOM			
Mr. Sal Castro	Observer	AMSEL-ACCS-E-SI	995-3810
Mr. Joe Hill	Observer	AMSEL-ATDD-SC	995-2518
TCATA			
COL Tucker	Observer	ATCT-BA	738-9401
AMSAA			
Ms. Pat Cook	Observer	AMXSY-CC	298-5350

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